LAND ECONOMICS

a quarterly journal of

PLANNING, HOUSING & PUBLIC UTILITIES

UNIVERSITY OF MICHIGAN
JUN 30 1958
BUSINESS ADMINISTRATION LIBRARY

Workable Competition and Regulatory Policy in Television Broadcasting
Harvey J. Levin
Limitations of the Theory of the Firm for Water Resource Analysis
Warren S. Gramm
Community Specialization in Durable and Nondurable Goods Manufactures
Albert J. Reiss, Jr.
An Appraisal of the Economics of Scale in the Motor Carrier Industry
Edward W. Smykay
Exclusive Agricultural Zoning: An Appraisal I—Shortages
Jack Lessinger
Theory of Supply of Farm Land
Virgil L. Hurlburt

Also

BOOK REVIEWS AND OTHER TIMELY ARTICLES

"Whatever May Be the Limitations Which Trammel Inquiry Elsewhere We Believe the Great State University of Wisconsin Should Ever Encourage That Continual and Fearless Sifting and Winnowing By Which Alone the Truth Can Be Found."
From Report of Board of Regents, University of Wisconsin, 1894

VOLUME XXXIV, NUMBER 2 MAY 1958 PRICE $2.00 A COPY

SOCIAL RESEARCH

An international quarterly, founded in 1934, pubished by the
GRADUATE FACULTY OF POLITICAL AND SOCIAL SCIENCE
of the New School for Social Research, New York

Contents for Spring 1958 (Volume 25, Number 1)

The World Federation of Trade Unions ---------- *George E. Lichtblau*

The "Tyranny of the Majority" ---------- *Ferdinand A. Hermens*

The Concept of Class and American Sociology ---------- *Arnold M. Rose*

Class Fertility Differentials Before 1850 ---------- *Dennis H. Wrong*

"Socialized" Health Services in Saskatchewan ---------- *Milton I. Roemer*

Letter to Editor ---------- *Abraham Ascher* and *Guenter Lewy*

Book Reviews

Published in Spring, Summer, Autumn and Winter

Subscription $5 a year (Foreign $5.50) — Single copies $1.50 plus postage

66 WEST 12TH STREET, NEW YORK 11, N. Y.

JOURNAL OF FARM ECONOMICS

Pubished by **THE AMERICAN FARM ECONOMIC ASSOCIATION**
Editor: Robert L. Clodius
University of Wisconsin, Madison, Wisconsin

VOLUME XL **May 1958** **Number 2**

Proceedings Papers — Joint Winter Meetings

Articles

Structural Changes in the Meat Wholesaling Industry -- *Willard F. Williams*

The Family Farm and the Land Speculator: Reflections on a Much Worked Theme ---------- *E. Louise Peffer*

Some Current Developments in Futures Trading ---------- *Roger W. Gray*

The Urbanization of the Open Country ---------- *Kenneth C. Nobe*

Educational Requirements for Extension Workers with Suggestions on In-Service Training ---------- *Harold C. Love*

The Agricultural Exemption in Interstate Trucking -------- *Celia Sperling*

Output in Relation to Input for the Agricultural Industry --- *Earl O. Heady*

Planning Efficient Operations for Cherry Processing Plants ---------- *Vernon L. Sorenson*

Economies of Size in the Cattle-feeding Industry of California ---------- *John A. Hopkin*

Membership Attitudes of the American Farm Economic Association ---------- *Harry C. Trelogan*

This journal contains additional articles, notes, book reviews, and announcement of new bulletins in agricultural economics and is published in February, May, August, November and December. Yearly subscription is $7.

Secretary-Treasurer: LOWELL S. HARDIN
Department of Agricultural Economics
Purdue University, Lafayette, Indiana

LAND ECONOMICS

a quarterly journal of

PLANNING, HOUSING & PUBLIC UTILITIES

CONTENTS MAY 1958

Workable Competition and Regulatory Policy in Television Broadcasting ..... HARVEY J. LEVIN 101
Limitations of the Theory of the Firm for Water Resource Analysis .. WARREN S. GRAMM 113
Community Specialization in Durable and Nondurable Goods Manufactures ..... ALBERT J. REISS, JR. 122
Production Goals for Forestry ..... G. R. GREGORY 135
An Appraisal of the Economics of Scale in the Motor Carrier Industry ..... EDWARD W. SMYKAY 143
Exclusive Agricultural Zoning: An Appraisal I—Agricultural Shortages ..... JACK LESSINGER 149
Theory of Supply of Farm Land ..... VIRGIL L. HURLBURT 161

Reports and Comments

Observations on Foreign Trade in Lumber ..... *Marshall D. Wattles* 168
Comparative Performance of Electric Utilities Under State and Under Local Rate Regulation ..... *Roy J. Sampson* 174
Velocity Theory of Population ..... *Leopold Kohr* 178
Hawley and Duncan on Social Area Analysis: A Comment ..... *Charles M. Tiebout* 182
The Itinerant Trucker: A Problem in Business Growth ..... *Hugh S. Norton* 184

Book Reviews

Cities in Flood (P. Self) ..... Carl Feiss 188
The Grand Trunk Railway of Canada (A. W. Currie) ..... John F. Due 189
Great Cities of the World, Their Government, Politics and Planning (W. A. Robson, editor) ..... Charles S. Ascher 190
Recreation Places (W.Williams) ..... Alfred Shapiro 191

PUBLISHED QUARTERLY BY THE UNIVERSITY OF WISCONSIN
DURING THE MONTHS OF FEBRUARY, MAY, AUGUST, AND NOVEMBER

Editorial Office: Sterling Hall, University of Wisconsin, Madison 6, Wisconsin

Publication Office: 121 South Pinckney Street, Madison, Wisconsin

The contents of the *Journal* are indexed in the *Industrial Arts Index*

Information on *Preparation and Submission of Manuscripts* available on application to Editorial Office

Entered as second-class matter, January 3, 1938, at the post-office at Madison, Wis., under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized October 12, 1922. Printed in the United States of America.

Subscription Rates: $6.00 a year; $2.00 a copy. (Back volumes; $8.00. Single copies 1 year or more old; $2.25.) Remittances may be made by personal checks, drafts, postoffice or express money orders payable to *Land Economics*.

Agents of the *Journal* in Great Britain, B. F. Stevens & Brown Lts., 79 Duke Street, Grosvenor Square, London, W. C. 1.

Copyright: Contents of this issue are covered by copyright, 1958, by the University of Wisconsin. Copyright, 1958, in Great Britain.

LAND ECONOMICS

a quarterly journal of

PLANNING, HOUSING & PUBLIC UTILITIES

Published by The University of Wisconsin

EDITORIAL BOARD

Land Economics

RAYMOND J. PENN
University of Wisconsin

PHILIP M. RAUP
University of Minnesota

V. WEBSTER JOHNSON
Near East Foundation

Regional Planning

HOMER HOYT
Washington, D. C.

COLEMAN WOODBURY
University of Wisconsin

Urban Land

ERWIN A. GAUMNITZ
University of Wisconsin

RICHARD U. RATCLIFF
University of Wisconsin

Public Utilities

MARTIN G. GLAESER
University of Wisconsin

WILLIAM V. WILMOT, JR.
University of Florida

E. W. MOREHOUSE
General Public Utilities Corporation
New York City

Managing Editor
MARY E. AMEND

EDITORIAL COUNCIL

GRAHAM ALDIS
Aldis & Company,
Chicago, Illinois

CHARLES S. ASCHER
Professor of Political Science,
Brooklyn College

MORTON BODFISH
President, First Federal
Savings & Loan Association
of Chicago

JAMES C. BONBRIGHT
Professor of Finance,
Columbia University

MARION CLAWSON
Resources for the Future, Inc,
Washington, D. C.

ERNEST M. FISHER
Professor, Urban Land Economics,
Columbia University,
New York City

JOSEPH LARONGE
Real Estate Consultant,
Cleveland, Ohio

ERVEN J. LONG
Professor, Agricultural Economics,
The University of Tennessee,
Knoxville

H. J. O'LEARY
Public Service Commission,
Madison, Wisconsin

PAUL OPPERMANN
Director of Planning
City and County of
San Francisco

D. F. PEGRUM
Professor of Economics,
University of California, Los Angeles

PAUL JEROME RAVER
Superintendent, Department of Lighting,
City of Seattle, Washington

EMERSON P. SCHMIDT
Economic Research Director
Chamber of Commerce of the U. S.

HENRY SCHMITZ
President
University of Washington

LIONEL W. THATCHER
Professor of Transportation,
University of Wisconsin

WALTER H. VOSKUIL
Mineral Economist, Illinois State
Geological Survey, Urbana

HERMAN O. WALTHER
Editor, Appraisal Journal,
Chicago, Illinois

GORDON WHITNALL
Consultant, Planning and Government
Los Angeles, California

LAND ECONOMICS

a quarterly journal of

PLANNING, HOUSING & PUBLIC UTILITIES

MAY
1958

VOLUME XXXIV
NUMBER 2

Workable Competition and Regulatory Policy in Television Broadcasting†

By HARVEY J. LEVIN*

THE FEDERAL Communications Commission's lengthy Network Study,[1] appearing after three years of hearings on television's structure and performance, clarifies the consequences of existing network practices and the complex of factors blockading entry into one of our youngest regulated industries.

Network television emerges as an oligopoly where three firms account for all network time sales, for almost 70 percent of network-national spot time sales,[2] and where two of these firms account for a full 62 percent of the latter. Profit rates of these two firms have grown rapidly since 1950 and by 1955 rates of return on net assets were 44 percent for the Columbia Broadcasting System and 36 percent for the National Broadcasting Company (rates on tangible property were 99 percent and 88 percent respectively). Yet no new firms have entered. Indeed the American Broadcasting Company, the third network, had a hard time of it until its merger with the prosperous United Paramount Theaters Company (even then, returns on the merged company's television assets were only 4.5 percent in 1955). The fourth network, DuMont, withdrew in September 1955 after sizeable losses in networking. Nor does any new national network seem likely to enter in the foreseeable future, primarily because of technical scarcities of comparable facilities and economic factors at work in the

† This article is a review of *Network Broadcasting*, Report of the Network Study Committee of the Federal Communications Commission to the House Commerce Committee, Washington, D. C., 1958, 737 pp. Hereinafter the Report is referred to as the Network Study. The author acknowledges his thanks to the Federal Communications Commission for making available to him a pre-publication copy of the Study.

* Department of Economics, Hofstra College, Hempstead, New York.

[1] See *Television Inquiry*, Hearings on S. Res. 13 and S. Res. 163 before the Senate Committee on Interstate and Foreign Commerce, 84th Cong., 2d Sess., 5 parts, 3464 pp., Washington, D. C., 1957, and *Status of UHF and Multiple Ownership of Television Stations*, Hearings on S. 3095 before the Senate Committee on Interstate and Foreign Commerce, 83rd Cong., 2d Sess., 1177 pp., Washington, D. C., 1945; also see *Monopoly Problems in Television*, Hearings on the Television Industry before the House Antitrust Subcommittee, 84th Cong., 2d Sess., 4 volumes, 3341 pp., Washington, D. C., 1957.

[2] National spot time sales refer to sales by station representatives to regional and national advertisers of those portions of station time not used for network broadcasting. Roughly speaking, regional and national advertisers consider national spot time as a fairly good substitute for network time where the latter is not available. Unlike network advertisers, who are required to spend a minimum sum or to order a specified list of basic stations, spot advertisers face no such limitations and may place orders for whatever groups of stations and markets they prefer.

network-affiliate relationship. (IV, 195-204)[3]

Because of limited opportunities for promoting more competition among the national networks, the Network Study analyzes competition *between them and other components of the television industry.* Network practices such as option time,[4] affiliation criteria, must-buy requirements,[5] and criteria for fixing rates and compensation of affiliates, are studied for their possible effects on competition between the networks and the independent program suppliers, between networks and national spot representatives, between network affiliates and independent stations, and so on. The economic impact of multiple station ownership is also analyzed extensively. Proposals are made to enhance competition, to promote local and diversified station ownership and to restore greater independence to affiliates in their selection of network programs. These policies in turn are seen to diversify program fare and to implement television's function as a community outlet for divergent ideas.

With a few important exceptions, this writer agrees with the Study's conclusions. But he believes the argument could have been strengthened; that the Study's interpretation of FCC objectives and past policies sometimes smacks of wishful thinking; and that some of the conclusions themselves are debatable or at least inadequately supported by fact. The following expository and critical comments are offered in a constructive way with no attempt to minimize the remarkable piece of empirical inquiry that the ten-man Network Study staff, financed by Congressional appropriations of $220,000, conducted over a two-year period. Indeed their accomplishment is all the more impressive when one recalls the abundance of conflicting testimony offered by the networks and their critics to Congressional committees in 1956.

I. *Network Concentration*

A. *Measurement.* Briefly, the economic power of three networks is characterized as follows. Their access to national audiences via their ownership of stations is considered low (20%-23% for each network)[6] as is their control of tangible industry assets (27.7%) and their control of the production of programs shown on network television (here scattered figures for network program production range between 22% and 28% for programs shown on Columbia Broadcasting System and National Broadcasting Company and 13% for American Broadcasting Company—although all figures would be smaller if national spot program time was also included). But the major index computed—that for national television time sales—is higher; the networks control a full 69.9% of total network national spot-time sales; 20.2% via station ownership, 46.6% via affiliation contracts, and 3.1% via their national spot representation of independent stations. Lastly, concentration ratios are equally high for their control of the prime evening hours (6-11 pm) where three networks account for 78.2% of program time in periods subject to option time on 299 affiliates, and 35.5% of prime program time outside the option period.[7]

[3] All parenthetical textual citations refer to chapters and pages of the Network Study.

[4] By "option privilege" the Federal Communications Commission refers to any agreement preventing network affiliates "from scheduling programs before the network agrees to utilize the time during which the programs are scheduled, or which requires the station to clear time already scheduled . . . ." (Also see fn. 17 below.)

[5] "Must-buy" requirements refer to a list of basic stations that the Columbia Broadcasting System and National Broadcasting Company require advertisers to order if they wish to buy time on *any* of the stations.

[6] Since the networks overlap each other, the unduplicated coverage of all three is only about 30%, and in all large markets they compete for audiences with from one to four non-network stations.

[7] Indeed, in the top 50 markets networks account for almost all their affiliates' prime option time and for one third of prime non-option time. Even in the more than 100 markets where at least one network had a primary affiliate, three networks account for over three quarters of option time.

The major concentration ratios—based on network and national spot-time sales—subsume that the relevant market for analysis is that of national television advertising expenditures. This is justified largely by estimating that the cross elasticity of demand by advertisers for different media, printed and electronic, is small, and that they are poor substitutes in the eyes of advertisers because of their different basic appeals and their tendency to reinforce rather than duplicate each other in a balanced advertising budget.[8]

There is much that is appealing in this assumption, bolstered by random interviews with advertising agencies. But one wishes that so extensive a study as this, breaking such new and important ground, had undertaken statistical analysis of relevant cross elasticities to help establish once and for all this debated property of media substitutability. By defining the relevant market as national television advertising, rather than as national advertising for all media, or as total local, regional and national TV advertising, or as the production of entertainment, news and commentary by all media for the public, the Study rightly carves out a rather limited basis for analysis. But it is disquieting that television does seem to have made significant inroads upon movie attendance, movie revenues, radio audiences and radio advertising revenues. Perhaps television is a better substitute for radio and the movies, if not for newspapers and magazines, than imagined. It may be that inter-product competition is one way in the case of growing new services such as television and that a reciprocal competitive impact of radio and the movies is unimportant in estimating the economic power of network television. But so novel an assumption should have been established more convincingly and not left implicit as it was.

B. *Bases of Concentration.* The treatment of factors supporting concentration—the bases of oligopoly power and of restricted entry—is the core of this Study and from it flows the rest of the analysis. The failure of new firms to enter, notwithstanding the high profits of two major firms, is attributed partly to the network-affiliate relationship and to the commercial incentives therein, to high interconnection costs and to certain economies of large-scale operations in programming.[9] But the main factor is technical—the shortage of comparable facilities.[10] Thus, without four comparable facilities in the top 50 markets, four networks cannot compete and this is said to underlie DuMont's withdrawal from the field. Present estimates are that there are only 19 such markets in the top 50 or only 27 in the top 100. Without a technological revolution, we are told, network television must remain an industry with few firms and high profits and so we are admonished to survey the resulting trade practices carefully and to encourage competition among the oligopolists and between them and other components of the industry. The only alternative to promoting competition within the present economic-institutional

[8] Analogous points should have been made for the other concentration ratios, too.

[9] The role of multiple station ownership by networks in further blockading new entry is noted at several points but the Study unfortunately omits it in its analysis of the bases of network concentration.

[10] Strictly speaking, outlets operating in the so-called Ultra High Frequency band (300-3000 megacycles) are not now "comparable" to those in the older Very High Frequency band (30-300 megacycles). This is because sets capable of receiving UHF signals are far fewer than VHF-only sets because advertisers strongly prefer to use VHF stations as a cheaper vehicle for reaching a given number of people and because, as a consequence, the major networks prefer to affiliate with them. But in computing the number of markets with four or more comparable outlets the Study includes "mixed" markets with both kinds of outlets if the UHF stations are network owned, as well as those markets with four or more UHF outlets and four or more VHF outlets. It also considers FCC's plans to make certain markets homogeneous in the future.

structure is that of more basic changes such as federal subsidies to the UHF, a subscription service (without advertising support), a national television service provided at a fee to all stations along lines of the existing news services, Commission regulation of rates and the rationing of station time among program suppliers and advertisers, the recapture of a frequency's value upon the sale of a station, the recapture of the economic rent accruing to users of frequencies in the choicest markets. (I, 10; XV, 665) The Study deliberately refrains from examining such alternatives, citing them only as a veiled threat, in case competition is not made more effective.

Without questioning the importance of such pioneer research into the bases of network concentration, the Study's argument is nonetheless open to several criticisms. On one hand, FCC's role in *restricting* the entry of station applicants, and thus indirectly of new networks, is largely ignored and inadequately tied into the analysis of blockaded entry. The Study tends to minimize the past contradictions in FCC's actions, presenting a picture of what *it approves as desirable* as though it were one that the FCC has *in fact*, and with no qualifications, established as its own interpretation of the public interest. Yet in the pursuit of other proximate goals and in response to outside political pressures, the Commission has sometimes acted to abridge competition.

Thus it is quite true that FCC has encouraged new entry at the station level by refusing to protect existing stations against financial loss (III, 67-76), by imposing no requirement to show "need" (for service) in any community before granting licenses, by preventing duplication of coverage, and by encouraging the entry of newcomers without interests in either media (III, 82-90), etc. It has also sought to promote equal competitive opportunities by gradually separating VHF and UHF markets. (III, 76-81)

But some authorities attribute many of UHF's troubles to FCC "mismanagement" or at least to its attempt to maximize multiple service communities and geographic coverage as quickly as possible by mixing both types of outlets. And though selective separation of VHF and UHF channels is certainly an attempt to promote competition and encourage new network entry, totally different allocation schemes—e.g., a complete move of all television to the 1319 UHF channels—might achieve the objective more efficiently. By failing to explore such alternatives quickly or thoroughly, according to some critics, FCC actually missed an excellent chance to reduce the scarcity of comparable facilities.[11]

FCC has also blocked entry for various other reasons: for the sake of improved engineering standards of signal (not until 1945 were standards lowered such as to allow a wartime backlog of applicants to enter standard broadcasting); for the sake of ironing out technological problems that might obstruct effective growth and innovation of new techniques (the 44-month cessation of all new grants that ended May 1952); and for the sake of educational operations (the reservation of 90 channels in frequency modulation

[11] For an incisive critique of FCC's "mismanagement" and its failure to pursue remedies quickly enough, see Hennock's statement in *Television Inquiry*, I, especially pp. 286-291. Also see the informative exchange in *Monopoly Problems in Television*, I, 3694-3696, 3698-3702, 3707. The case for a complete move to UHF is reviewed in *Ibid.*, I, 3267-3271. The costs of such a move are estimated by CBS in *Ibid.*, III, 5031-5044, and by FCC in *Ibid.*, I, 3271-3274. Other alternative allocation schemes to promote competition are proposed by CBS (*Television Inquiry*, II, 813-819, 827-828), and by ABC (*Ibid.*, 757-758, 773-777; also in *Monopoly Problems in Television*, III, 4763-6, 4774-4780).

radio and 258 channels in television).[12] One additional indication of why FCC has sometimes restricted entry, or accepted it where it appears, may be inferred from its so-called "bluebook" in 1946. Rather than call for new entry and more competition in that document, the FCC simply pointed out that radio's lush profits in 1944-45 warranted a *higher quality of programming* and that the networks had no excuse for lagging in this regard. In other words, the special demand for radio time by advertisers in the face of newsprint shortages, and the restricted entry into radio—at that time due not only to technical barriers but to the cessation of all wartime construction—were recognized as factors bolstering radio's profits but the profits were to be justified by a *compensating improvement in output.*[13] Indeed our television networks have adopted this argument today insofar as they never tire of saying that only their prosperity guarantees an expensive, rich program service; and the Study acquiesces to this by accepting networking as essential and by going to such pains to show that its proposed rule changes will not seriously damage network stability.

Our second criticism regards the Study's very able analysis of how the scarcity of facilities in the top 50 to 100 markets blocks the entry of a fourth network, notwithstanding DuMont's withdrawal and the profits of the Big Two (IV, 198-204). This analysis would have been even more convincing if it had tried to consider the chances for entry *over the next 3 to 5 years, on varying assumptions of growing national income, advertising potential and television's relative share.* True, four or even five national networks do not necessarily guarantee much more competition than three. But in view of the pains taken to measure the possibility of entry in response to existing profits, the Study should at least have probed the thesis that, if the market grows sufficiently, even the 85%-15% division of the market between two large and two small networks (true in 1954) might suffice to support four networks, notwithstanding the UHF problem.

In short, just as the allocation table offers one fruitful line to alter the existing structure the better to promote local and diversified station ownership and new network entry, so does analysis of market growth bear importantly on these matters from another viewpoint. As things now stand, readers of the Study may well conclude that any real advance in diversifying output and in implementing FCC's several goals simultaneously, will come not through possible changes in the network rules—for which small claims are actually made—but through those *alternative institutional arrangements* deliberately excluded from the Study. Certainly, if we accept the working assumptions of unchanged technical and market conditions, we may reasonably ask whether the trade practices under scrutiny will not tend to recur in some form even if the present versions were curbed—a possibility recognized in the Study. Should such be the case, of course the alternatives confront-

[12] Indeed the 44-month "freeze" on all applications is probably the most serious restriction on entry in television's whole history and a major cause of many of UHF's economic troubles and the related shortage of comparable facilities today. Surely whatever FCC's reasoning at that time, one serious consequence was the entrenchment of 108 key VHF stations in the choicest markets with the best network and advertising affiliations.

[13] See FCC, *Public Service Responsibility of Broadcast Licensees* (Washington, D. C., 1946), pp. 47-54. More recently FCC denied that it had any power to consider "excessive" station profit rates when granting or renewing licenses. But there was explicit concern that no FCC rules or regulations jeopardize the industry's financial ability to implement proposed program plans. (See *Monopoly Problems in Television*, I, 3347-3362). Lastly, FCC has frequently overridden its proximate goals of competition and ownership diversification where absentee multiple owners, or other media owners had resources, experience and past performance records clearly superior to those of local residents or of newcomers to the media. Network Study, III, 126-7; XII, 568-70).

ing us may well be those of *continued policing* on the one hand, and of some *fundamental institutional innovation* on the other.

II. *Network Practices*

In its extensive treatment of trade practices the Study reviews several complaints leveled against the networks by independent stations, independent program suppliers, regional and local advertisers, and by the two Congressional committees investigating television in recent years.[14] The complaints in question are fivefold:

(1) That networks discriminate systemmatically against smaller stations in smaller markets, especially those near large cities, and against UHF outlets—in each case withholding vital affiliation contracts that often mean the life or death of such stations. (V)

(2) That option time largely accounts for the networks' dominance of prime evening hours in the choicest, big city markets and for the difficulty of independent stations or new networks in entering such markets. (VI)

(3) That the must-buy requirement discourages small local, regional and even some national advertisers from buying time on network television because they cannot afford to order the whole prescribed list of stations or because the pattern of their needs does not coincide with the basic list. Larger, wealthier advertisers, and multiple owners who can get their stations on the list in doutbful cases, gain unfair competitive advantages. (IX)

(4) That networks extort disproportionate sums from affiliates by their control of advertising rates and by their power to arrange compensations paid to the affiliates for clearing any network programs. Networks have manipulated these rates and compensation schemes to gain program clearances otherwise not forthcoming. (VII-VIII)

(5) That multiple station ownership by networks helps them further to block new network entry and to strengthen their position vs. affiliates. Non-network multiple owners gain unfair competitive advantages over single station owners by the concessions they exact from networks in matters of affiliation, rates and compensation. (XII)

1. *Affiliation Criteria.* Within markets of comparable buying power, population and interconnection costs, the networks select affiliates roughly to maximize the unduplicated circulation of their service area relative to the cost of reaching it, although this is sometimes waived to gain television connections with the network's radio affiliate, or where an outlet with overlapping service offers the network more complete coverage of a choice audience than other networks can get from affiliates outside the market. But in choosing between stations of *equal* circulation—itself hard to ascertain—networks say that they prefer stations operated by multiple owners or newspapers possessing superior physical facilities and having overall popularity and radio experience; and this operates to the serious disadvantage and survival of newcomers with modest resources. Nonetheless the Study concludes that the maximization of unduplicated circulation itself, and not deliberate conspiracy, largely explains the reluctance to affiliate with UHF stations, with stations in small markets or "overshadowed" markets (overlapping the service area of big city stations).

For example, without adequate resources or a major network affiliation, UHF stations fail to transmit those programs of wide appeal without which few listeners will convert to UHF sets or buy all-channel receivers at higher prices than VHF-only sets. VHF stations get most network programming because they presently have much more extensive cover-

[14] The real magnitude of the Study's analytical job and the basic reasonableness of its conclusions are clear from a perusal of the contradictory evidence and claims of the different interested parties. See *Television Inquiry*, IV, 1475-1590 (independent station KTTV), 1695-2270 (CBS), 2271-2464 (NBC), 2465-2514 (ABC); see also the committee views in *Report of the Senate Commerce Committee on Television Network Practices*, Washington, D. C., 1957, and in *Report of the House Antitrust Subcommittee on the Television Industry*, Washington, D. C., 1957.

age and better signal quality and more experience than the UHF operators. The lower cost of reaching any number of viewers, the Study implies, and not an attempt to coerce UHF interests the better to bolster their oligopoly power, explains the network's preference for VHF. Given this preference, to be sure, program resources for UHF deteriorate, further reducing its ability to get first-class advertising accounts.[15]

Regarding small markets, on the other hand, the Study notes with approval the special CBS-NBC affiliation plans to help stations so situated—notwithstanding weak market support— and their attempt to "sell" such markets to skeptical advertisers. But network failure to affiliate with stations in overshadowed areas is treated as more suspect, with the possibility raised that the networks have been too sensitive to their existing affiliates' wishes in this regard and that existing service areas may have been protected irrespective of the quality and range of programming then available to the public.

Within the present technical-institutional framework, then, business objectives appear to conflict with the social objective of a revitalized UHF band, and of establishing more local stations in small or overshadowed markets. Yet the Study picks few bones with the network affiliation criteria, probably just because it accepts as "given" the existing allocation plan, the present UHF distress, and the present system of networking; and because it fears any direct, detailed administrative interference with network business practices. Except for an outright condemnation of the criterion of multiple ownership and a proposal to modify the right to 'first call,'[16] the Study's main hope lies in increased publicity by the networks of their affiliation criteria, the contention being that fuller market information would strengthen the affiliates' position and weaken the networks' use of affiliation and disaffiliation as a lever to secure fuller, steadier program clearances. The publicizing of affiliation criteria is also expected to prevent existing affiliates from keeping nearby rivals from gaining network affiliations in overshadowed markets. (V, 248-54)

2. *Option Time.* The Network Study prepared several original statistical exhibits to ascertain the relative frequency with which the networks, especially the Big Two, managed to gain program clearances during different segments of the broadcast day in option and non-option time. (VI, 307-330) The findings show on the whole that clearances were somewhat more frequent in option time and that this was especially true during the prime evening hours. This is qualified by the fact that very popular programs apparently cleared regardless of option privileges and that unpopular programs did not clear notwithstanding the privileges. In short, the Study found that option time created some obliga-

[15] Less satisfactory is the Study's account of how the vicious circle started and of other factors that accentuate it. FCC's early decision to mix UHF and VHF markets, regardless of their potential profitability, is rightly blamed for creating some of today's problems. Another thesis that should at least have been mentioned is that the major set manufacturers, heavily involved in VHF production, failed to publicize and promote vigorously the sale of all-channel receivers and converters (although they now do support tax relief on such receivers). Lastly, time pressure prevented more than cursory inquiry into the bearing on the UHF problem of the networks' strong preference to affiliate with VHF stations owned by their *radio* affiliates (even if this means disaffiliating with other stations in the same market) and their additional preference for stations with newspaper owners or multiple owners—such stations also generally operating in the VHF band.

[16] Networks now grant first option (i.e., the right to 'first call') on network shows to their affiliated stations and also grant them a limited territorial exclusivity. Should the affiliate agree to carry the show, other stations in the same market will have no access to it, even though the advertiser might prefer to place it elsewhere to avoid a serious delay in transmission or clearance at an off-hour. Although the Network Study endorses the right to 'first call' in principle, it also proposes to modify it such that networks must try to place programs on other stations in the market if the advertiser so desires.

tion for affiliates to clear, depriving them of complete freedom to choose their programming; that some affiliates accepted some network programs they would otherwise not carry or else carry on a delayed basis. It also found that independent film producers, independent stations, and national spot representatives tended to be excluded from the prime evening hours; and that national, regional and local advertisers seeking access to television are at a competitive disadvantage.[17] Indeed if option time did not have at least these limited effects, one wonders why the networks would retain it.

But there is no evidence that the impact is great, or that the practice is as essential to networking as the networks hold, or that a really sizeable erosion would occur if it were abolished. (VI, 367-79) The Study concludes that networks would continue to clear most programs anyway on grounds of quality. But it still proposes to eliminate option time to tip the balance for entry in marginal cases and, more important, because option time *in conjunction with other practices* acts to strengthen network bargaining power in getting program clearances. Outright prohibition of the practice is predicted to do little serious harm and yet to promote some additional entry of advertisers, program suppliers, independent stations, and to result in additional variety for the public.

3. *Must-Buy.* The must-buy requirement is treated similarly. There is no evidence that it seriously preempts many small, local and regional advertisers who cannot afford the whole basic list if only because so many advertisers now order more than the prescribed list anyway. The main problem is not that a few advertisers are actually preempted or that a greater number are forced to order stations in markets they don't really want; but rather that the must-buy list *in conjunction with other practices* enhances the networks' bargaining power with their affiliates, and indirectly acts to entrench them in the prime evening markets.[18]

Nor would the proposed abolition of must-buy disrupt network finances seriously, according to the Study, for there is apparently no direct relationship between revenues from the basic stations and the fixed costs of network operation. Originally, the basic list sought to recover expenses of costly segments of transcontinental cable, but this is no longer true, we are told, and now it far exceeds the needed revenues; indeed the specific basic stations themselves are not always justified on grounds of operating costs.[19]

One unexamined thesis which deserved attention is that option time and must-buy vary in their effectiveness with fluctuations in national advertising expenditures. For instance, in bad times, with low absolute advertising budgets, the networks may well be more anxious but less able to guarantee that certain

[17] This is true despite the fact that stations are now required to retain the right to reject network programs found unsuitable, to receive at least 56 days' notice on option programs, to limit such clearances to three hours within each of four segments of the broadcast day (12 hours in all), and to refrain from granting option privileges that bar or displace other networks. The Study actually finds "option time" reasonably analogous to "block booking," condemned as a *per se* violation of the Sherman Act (sec. 1) in *U. S.* v. *Paramount Pictures, Inc.*, 334 U. S. 131 (1948), (Network Study, VI, 379-89).

[18] The Study also finds the practice analogous to tie-in arrangements condemned *per se* section 1 violations in *Times-Picayune Publishing Co.* v. *U. S.*, 345 U. S. 594 (1953), and *U. S.* v. *Northern Pacific Railroad Co.*, 142 F. Suppl. 679 (1956), and also analogous to "block booking" in the Paramount case. (Network Study, IX, 503-522.)

[19] Although it would eliminate the must-buy list, the Study actually tolerates the so-called minimum-buy arrangement which requires advertisers to spend some minimum sum on the whole network but which leaves them free to select the stations and markets they wish. (Network Study, IX, 524-7) Minimum-buy supposedly avoids making advertisers order specific stations against their business interests and also reduces network bargaining power vis-a-vis specific affiliates so far as the latter are now anxious to get on the must-buy list especially where their market position is marginal.

groups of stations are ordered. By confronting advertisers with an all-or-nothing offer they might try to force their hand in marginal cases, perhaps diverting some outlays from rival media. These are the times, however, when affiliates are hoping for network shows and national sponsors and might conceivably clear *more* programs than those required by option privileges. In prosperous times, on the other hand, the reverse might be true; with advertising budgets up the must-buy list would be less useful to stations and networks alike although easier to enforce because advertisers would probably want to order the stations anyway; whereas option privileges might well be needed to maintain station clearances for network programs in the face of probable competition from non-network program suppliers now able to find sponsors more readily. In view of similar origins of trade practices in other industries, the thesis should at least have been posed here.[20]

4. *Rates and Compensation.* In setting time rates for their affiliates, the Network Study finds that the two major networks compete freely, with the third network sometimes consulting with them before executing its own rate changes but with no visible agreement to restrain competition. The evidence which the Study analyzes further indicates that most criteria used in setting rates are reasonable—criticisms to the contrary notwithstanding. But the Study does urge the prohibition of the use of rate decisions as a lever for obtaining program clearances and the practice of making rate increases contingent upon the acceptance of certain programs. (VII, 421-7)

Likewise, in matters of compensation the networks have by no means seriously exploited their affiliates—after the discounts, commissions, and interconnection costs are deducted. On the contrary, the Study discovers that compensation arrangements generally reflect station profitability to the network. But there are important exceptions in big single-station markets where the networks wish to preempt their rivals and where multiple owners exact higher compensation as concessions for favorable treatment in other markets. Once more the problem is that the compensation schemes —special increments or sliding scale arrangements— are used to gain more program clearances. (VIII, 462-5) The Study recognizes that financial alternatives must guide the station's choice in programming and that premium compensation payments may help a newcomer enter tight markets but it asserts that the station's freedom of choice may be hampered and that program suitability, rather than compensation, should play a larger role in the choice. It proposes more publicity of compensation schemes and rate criteria on grounds similar to those justifying the publicizing of affiliation criteria (VII, 446-7; VIII, 466-8), and it urges continued policing by FCC to prevent potential abuses from materializing.

5. *The Networks and Multiple Station Ownership.* Although much of the Network Study's analysis of multiple station ownership, by networks or otherwise (XII), explores its adverse impact on local and diversified station ownership and through this on program diversity, three more strictly economic consequences are described also in passing. These are that multiple ownership may affect the chances for new network entry, the affiliates' economic position, and the resources available for adequate program service. At least, a treatment of such

[20] For a rather different version of this thesis see the CBS defense of option time in *Monopoly Problems in Television*, III, 5210-5212, and station KTTV's comments on the must-buy practice in *Television Inquiry*, IV, 1511-1513.

effects can be pieced together along the lines that follow.

Thus multiple owners may conceivably figure in the creation of new networks financially able to compete with existing ones. But network ownership of stations may equally *impede* new network entry because other networks cannot compete for affiliations with or substantial access to the network-owned station and because these stations are more obliged than others to clear all the network's programs and hence are less free to select competitive offerings. Furthermore, one network may displace another in key markets by purchasing a station heretofore affiliated with a rival; whereas in other cases the network's power to withhold affiliation may operate as a lever in persuading otherwise uninterested independent licensees to sell it a station.

There are also conflicts of interest between networks and their affiliates and here the network-owned stations often figure in gaining acceptance of policies the affiliate opposes. In this regard, according to the Study, networks have tried to keep affiliates from setting national spot rates so low relative to network rates as to constitute a serious competitive threat for advertising outlays. They have also sought to reschedule their programming notwithstanding opposition by many affiliates on grounds of local competition. Finally, they have campaigned to maintain uniform time rates for color and monochrome TV and for all interposed ("cut-in") commercials regardless of variations in different markets. To gain the support of reluctant affiliates in such cases the network generally requires its own stations to adopt the desired policy as a model, although we remain unclear as to exactly how this helps achieve the objective.

Lastly, the networks claim that lucrative stations with stable incomes are needed to support network operations that would otherwise show returns too low and too uncertain for the highest quality programming; that their stations provide useful laboratories for program ideas and talent and for training new network personnel. Like other multiple owners, moreover, the networks cite with pride their abundant program resources, their long broadcasting experience and superior engineering facilities, also their ability to enter communities before market support develops, to develop new technology, and to provide venture capital to UHF, etc. But the Study rightly distinguishes between theoretical possibilities and actual probabilities that such resources will contribute to technological progress or to a more extensive and higher quality service.[21] One only wishes that refutable hypotheses had been formulated and tested here in view of this question's crucial bearing on public policy in the whole area.

Short of this, the Study would place the burden of proof on the multiple owners and proposes that FCC evaluate their applications case by case in comparative hearings where newcomers to radio and television compete with them for new grants, or for their licenses at renewal time, or for the right to buy some

[21] The Study also observes that non-network multiple owners have more bargaining power vis-a-vis the networks than do single-station owners in getting favorable rates and compensation for programs they carry, in securing choice affiliations for all their stations—even those that would never pass muster if singly-owned—and in getting them on the network's must-buy list. Multiple owners, network or otherwise, have been said to exact special price concessions from independent program suppliers and from national spot representatives to whom they pay commissions. Yet the Study does not find the public benefiting from the exaction of such transfers even though the multiple owner may share the networks' and film syndicators' gains more than do single-station owners. (Network Study, XII, 564-70)

station up for sale. (XII, 591-9)[22] Unfortunately, two possible effects of this important procedural innovation were conspicuously ignored and this needlessly weakens the Study's position: namely; (1) that comparative hearings may introduce a serious risk element into telecasting at the time of new grants, raising the cost of entry, in view of the long, time-consuming procedures involved, the many contradictory decisions of administrative commissions, and the uncertainty of how any case will be decided. And (2) that comparative proceedings at renewals may increase uncertainty and reduce incentives for long-run planning and investment by stations fearful that the program promises of rivals might win their licenses notwithstanding adequate past performances, especially if the rivals were favored as local residents or newcomers. Unless such effects are minimized or corrected, the procedure may unintentionally block entry and harm the industry's performance as well. Promotion of the proximate goal of diversified and local ownership would then obstruct and not implement the ultimate goal of program diversity.

Conclusion

To sum up, certain trade practices have arisen in network television which act to restrain competition among the networks, independent program suppliers and independent stations—and to exclude certain advertisers. But the Study proposes no direct control of rates, affiliation criteria, and compensation schemes, or more drastic institutional alternatives; nor any vigorous attack on technical-economic structure.[23] It prefers simply to encourage more publicity of the network's decision-making procedures and standards, the better to strengthen the affiliates' bargaining power by reducing the chances of discriminatory, arbitrary or restrictive action. Greater discouragement of multiple station ownership by networks or otherwise, outright elimination of option time, and the must-buy requirement, are proposed to open entry somewhat more without severe repercussions on network stability. In short, the aim is to alter the network-affiliate relationship so as to reduce the network's power to exact program clearances not clearly merited, without at the same time seriously reducing their resources for high grade programming.

Taken singly, no one practice mentioned is viewed with great alarm except perhaps the rapid growth of multiple-station ownership. But together they are said to constitute a real danger so far as they operate to enhance the networks' bargaining power and leverage in gaining clearances in prime markets. This is difficult to see at first. Supposedly the affiliate will provide all the requested clearances (unless some program is considerably better) to assure that his affiliation contract is renewed, to gain premium time rates and compensation arrangements, to get or stay on the must-buy list and, in general, to maintain good business relations with the network. This is especially true where his bargaining power is weak or where he must vie with

[22] More precisely, the Study recommends: (1) that each licensee eventually be limited to the ownership of one station only; (2) that presumptions be established in the case of new grants and transfers but not license renewals, that local residents and newcomers to television are better able to serve the community than are outsiders or multiple owners; (3) that in the case of license renewals, local and diversified ownership simply be weighed with other factors in reaching a decision; (4) that newcomers to television be required to operate their station for the full three-year license term before applying for more stations; (5) that no licensee be allowed to own more than 3 VHF stations in the top 25 markets even if this require divestiture actions.

[23] One of the most far-reaching recommendations was that Congress should empower the Federal Communications Commission to license the networks and thus to apply all relevant rules and regulations directly to them. This would open the way to a periodic review of network programming and network finances, in addition to the indirect control now exercised through the review of station operations.

multiple station owners for the network's favor.

Yet in view of the negligible role of any single practice in restraining competition, readers may wonder how the composite effect of all can be very serious, or whether the proposed changes, almost guaranteed not to inflict any serious harm on the networks, are really worth the trouble. If these practices do entrench the networks in the best markets and, with the scarcity of frequencies, act to block new network entry; and, if they also act to exclude non-network organizations as indicated, the chances surely are that the proposed changes would have serious effects. And unless the practices do help entrench the networks why would they be maintained so tenaciously?

The Commission's proximate goals of competition, local and diversified station ownership, and licensee independence—and the new network rules and other procedures implementing them—are supposed to promote an ultimate goal of program diversity and balance. But this is left for additional research to establish convincingly and the four proximate goals are treated as ends in themselves—all but one actually being desirable elements in economic structure pure and simple. (III, 156-160) Yet if such structural changes *per se are* a major objective, one wonders why the Study so often reassures the networks that the rule changes will not seriously disturb their financial stability. For even if technnical factors are held constant the true structural approach would surely not accept preservation of the existing network structure as a springboard and work from there—accepting the network's control of station rates, the minimum-buy rule, etc., as necessary because networking is necessary. It would allow advertisers to order just those stations in just those markets they preferred and would permit stations to set their own rates, reducing the networks to the position of national station representatives.[24]

The fact is that by taking the existing network system and its stability as conditions within which policy should operate, the Study actually emphasizes economic *performance* over economic *structure*, just as FCC has done on numerous occasions in the past, to some degree, overriding the goals of competition, ownership diversification and local ownership for the sake of extensive geographic coverage and abundant program resources. Whatever the actual merits of this position, which the writer believes to be substantial, it is unfortunate that the Network Study should criticize FCC for having done what, by implication, *it* now does. Rather might it have examined in greater detail the consistency of the Commission's proximate goals with each other and with the ultimate objective of program diversity.[25]

[24] Granted, of course, that the Study *does* propose that the networks be prevented from serving as national spot representatives for stations other than those they own and operate.

[25] Perhaps the most useful analysis of this matter appeared in the Congressional investigation of alternative allocation schemes where the Commission, the networks and their critics, each probed at length the consistency of the several goals set forth in FCC's *Sixth Report on Television Allocations*. (See *Television Inquiry*, II, especially the CBS testimony, pp. 786-842). Although the Network Study refrains from any analysis of allocations, within its own narrower scope of inquiry there is a comparable question. Now that FCC staff members have recently launched a supplementary study of programming, perhaps the consistency of the Commission's proximate goals with its ultimate goal of program diversity and balance (defined in fairly concrete terms), will at last be fully explored, the better to win the industry's acceptance of the proposed rule changes or, as the case may be, to lead to further modifications in these rules, or to additional studies of the important institutional alternatives mentioned earlier.

Limitations of the Theory of the Firm for Water Resource Analysis

By WARREN S. GRAMM*

THE demand for water in the United States may be expected to more than double in the next two decades. Since present use is only about five percent of annual precipitation,[1] there is little question of absolute shortage. However, given the limited number of natural storage facilities, the economics of water resource development will become increasingly significant in this period. Prices for alternative uses—domestic, agricultural, and industrial—will come under closer scrutiny. The comparative costs of alternative sources of supply and methods of conservation, such as conversion of sea water, sewage reclamation, and control of evaporation, transpiration, and natural run-off, will be reexamined with greater care.

Optimal development and use of this increasingly "economic" resource will depend, in considerable degree, on refinement of our methods of analysis. This is particularly true with regard to maximizing the natural water supply as it occurs in the hydrologic cycle. Here, short- and long-run developmental pressures are combined. Water wasting to the sea causes recurrent flood damage in major drainage basins. The anticipated secular increase in consumptive water use stems from the same population growth that is occurring in these basins. The steady creation of monetary and social values in these valleys simultaneously raises the condemnation costs of reservoirs and increases the costs of flood damage resulting from failure to construct such reservoirs.

The imperfect state of present water resource evaluation analysis is generally recognized. To a considerable degree, this inadequacy stems from the nature of the problem—its involvement with multiple, joint products and political complications. It is argued here, however, that part of the problem and one that will become increasingly important in the future, is excessive dependence on existing value theory. The theory of the firm provides too narrow a base for evaluation of the water resource, development of which customarily rests on much broader grounds than private profit maximization. The broad, socio-economic purposes of water resource development will be served only by making as inclusive as possible the comparison of cost and benefits of such development. A brief survey here of the technological and institutional roots of the problem will be followed by a detailed critique of present evaluation procedures.

Technical-Economic Fundamentals in Water Resource Analysis

Like other so-called inexhaustible resources, the natural occurrence of water is of a cyclic, self-regenerative nature. Evaporated moisture precipitated onto a given land mass is absorbed into the earth, runs off into a storage basin, or evaporates into the atmosphere. In the last two instances, and in the first under certain conditions, the water becomes available to begin the cycle once more. The time span of this cycle varies widely from place to place and season to season. Man's efforts to alter the cycle have been

* Department of Economics, University of California, Davis, California.

[1] James C. DeHaven, Linn A. Gore, and Jack Hirshleifer, *A Brief Survey of the Technology and Economics of Water Supply*, The Rand Corporation Report R-158-RC, Santa Monica, California, 1953, p. 9.

very effective on occasion. In the precipitation phase, recent efforts at "rainmaking," such as cloud seeding, have had a limited success. In the next phase man has been more effective, for his activities have significantly altered the quantity and rate of absorption, run-off, and evaporation. Alteration of the land cover through farming, grazing, and logging often has accelerated the amount and rate of run-off, often with proportionate increases in erosion and siltage. To solve this problem, attempts have been made to control run-off through protection of watershed surfaces and storage programs.

The primary implication of the cyclic nature of the water resource is the physical unity of the river basin when water is being considered in terms of utilization or control. This unity is generally accepted but the failure of theorists and policy makers in this field to think and act on the basis of the implications of such unity make appropriate its reiteration. The case of erosion and siltage presents one of the most obvious illustrations of such unity. The rate of siltage accumulation in a storage reservoir is a primary variable in its effective life. At the same time the rate of siltage is a function of the condition of the surface of the entire watershed. Thus, calculation of the economic feasibility of a given water storage project which must include consideration of its life span requires specific assumptions concerning maintenance of the watershed. Such interrelationships hold, in general, for all multiple-purpose project costs and returns and are the basis for taking the entire river basin as the basic physical unit in water resource evaluation.

Evolution of Water Resource Policy in the United States

Several basic themes may be traced through the evolution of federal water resource legislation. Grants for private development have included, since the passage of the River and Harbor Act of 1890, a definite time limitation to allow government reappraisal of the method and organization best suited to continued development. For over two decades public agencies and cooperatives have had preferred status for participation in development benefits.[2] Finally, the unity of water resource development—the efficacy of the multiple-purpose approach—has become a basic premise. Since the discussion here is concerned primarily with the last, a brief summary of its evolution is in order.

Multiple-purpose river valley development was proposed as early as 1908 in a report to the President by the Inland Waterways Commission. This approach was further recognized in 1925 by an act directing the Corps of Engineers and the Federal Power Commission to prepare joint reports, the "308" report series, on surveys of water resources.[3] The Boulder Canyon Project Act of 1928 authorized the first large-scale federal multiple-purpose project. With the establishment of the Tennessee Valley Authority in 1933, a single administrative agency was set up to carry out a program of comprehensive river basin development. The multi-purpose approach may be considered to have become established on a base of widespread public support following the 1934 report on the Mississippi River.[4] Much of what was suggested there was adopted in planning procedures of the TVA.

Though the multiple-purpose principle has been almost universally accepted in this country, debate on the extent and details of its application has never com-

[2] The future of this policy has been increasingly uncertain since the 1953 change in Federal administration.

[3] 43 Stat. (1925) 467, Sec. 3.

[4] Public Works Administration, *Report of the Mississippi Valley Committee* (1934), Morris L. Cooke, Chairman.

pletely disappeared. For example, the principle of an ever-empty reservoir to meet the requirement of flood control was indelibly stamped in many minds as being an inextricable contradiction to the desirability of maintaining the fullest possible reservoir for maximum hydroelectric power head. Years of missionary work were required to establish the possibility of compromising the several purposes of a given project to gain a maximum total benefit.[5] Recently, indications have appeared anew that the multi-purpose approach has not been completely accepted.[6] Nevertheless, the multiple-purpose principle remains a fundamental tenet in official water resource planning and development in the United States.

The Analytical Base of Present Water Resource Evaluation

Virtually continuous attention to the problem of water resource development since the 1930's culminated in 1950 in the publication of the reports of the President's Water Resources Policy Commission (PWRPC) and the Subcommittee on Benefits and Costs of the Federal Inter-Agency River Basin Committee (FI-ARBC). These publications largely epitomize current thinking on water resource development in this country.[7] The Subcommittee's analysis, the result of four years of effort, is especially significant because it provides the theoretical-analytical foundation for present policy.[8] The following review of its philosophy and recommendations will provide background for a subsequent critique of the Subcommittee's analysis, especially as the analysis concerns economic rather than financial feasibility of projects.

For an understanding of the Subcommittee's recommendations, one must understand the relationship between its conception of the problem of water resource development and its judgments concerning the limits of meaningful analysis thereof. In the Subcommittee's statement of the problem, the importance of the viewpoint from which the effects of a project are evaluated is explicity recognized:

> "It is apparent that in Federal practice a comprehensive public viewpoint should be taken; that is, a viewpoint which would include consideration of all effects, beneficial or adverse, short-range or long-range, that can be expected to be felt by all persons and groups in the entire zone of influence of the project."[9]

Hence, the need is clear for a public

[5] Illuminating discussion of issues in water resource planning and development and extensive bibliographies covering all major drainage basins in the United States are presented in unofficial, unpublished material prepared for a series of seminars on multiple-purpose projects that were part of the in-service training program of the Tennessee Valley Authority in the late 1930's and early 1940's. All major issues in the problem of multiple-purpose development were broached in these discussions. The only significant addition to discussion of these issues since that time has been some clarification of the problems involved in attributing value to the various project benefits and allocation of costs among the several beneficiaries.

[6] See, for example, Luna B. Leopold and Thomas Maddock, Jr., *The Flood Control Controversy Big Dams, Little Dams, and Land Management* (New York: The Ronald Press, 1954), p. 245.

[7] The President's Water Resources Policy Commission, Volume I, *A Water Policy for the American People* (1950). (Hereinafter referred to as PWRPC *Report*, Vol. I) United States Federal Inter-Agency River Basin Committee, Subcommittee on Benefits and Costs, *Proposed Practices for Economic Analysis of River Basin Projects* (1950). (Hereinafter referred to as FI-ARBC *Proposed Practices*). Members of the Subcommittee included representatives from the Departments of Agriculture, Army, Commerce, and Interior, and the Federal Power Commission. See also Engineers Joint Council, Water Policy Panel, *National Water Policy*. Mimeo. (1950).

[8] This position is supported by details in a third publication on water resource evaluation; Bureau of the Budget, *Circular No. A-47* (1952). The most recent statement of Federal policy, H. Doc. 315; 84 Cong., 2nd Sess., *Water Resources Policy*, report by the Presidential Advisory Committee on Water Resources Policy, does not include any proposals for basic alteration of water resource evaluation procedure. However, *Senate Resolution 281*, 84th Cong., 2nd Sess., adopted July 25, 1956 provided for a review of water resource evaluation procedures during the 85th Congress (1956-1957). Section 6 of this resolution provided for action by appropriate Senate committees ". . . . to design and to formalize a comprehensive and particularized set of standards and overall criteria for the evaluation of all proposed projects for the conservation and development of land and water resources . . . ."

[9] FI-ARBC, *Proposed Practices*, p. 6.

rather than a private or individualistic approach, and for long-term, comprehensive treatment. Meaningful analysis, on the other hand, requires as precise valuation and quantification as is possible. The Subcommittee concludes that the best obtainable approximation to the desired "public viewpoint" valuation will be based on market prices of project benefits and costs.

Though the limitations of market prices for reflecting public or social values are recognized by the Subcommittee, it concludes that since "most of the effects of projects involve goods and services which are readily evaluated in terms of market prices,"[10] the price system is the most useful available evaluation base. Prices may be applied directly to those goods and services which move in to exchange as project outputs and may be imputed to secondary effects. Prices are not to be applied to the third group, the intangibles, which are defined by their intransigence to monetary quantification.

The second major element of the Subcommittee's analysis is the application of marginal analysis to project formulation and evaluation. For the purpose of formulating the scale and composition of a project, the concept "separable segments" of input units is introduced. This is ". . . . the smallest increment on which there is a practical choice as to inclusion or omission from the project."[11] The use of the term "separable segments" is apparently an attempt to reconcile the assumption of perfect divisibility of productive factors and a single product, posited by marginal analysis, with the actuality of imperfect divisibility and joint products that are characteristic of multiple-purpose water projects. Combining the assumption of precise quantification through the price system and the separability of project components, the Subcommittee concludes further that the ". . . . scale of development of a project should be established at the point where the net benefits from use of resources for project purposes is at a maximum."[12]

Based on the above propositions, the Subcommittee makes a number of policy recommendations to the several agencies concerned with water resource development. Monetary values should be derived from the market mechanism for the primary and secondary elements of all project effects. The intangibles are to be given appropriate descriptive treatment. Values should be based on long-term price projections applied to the anticipated dates of construction and benefit realization of specific projects. Project formulation procedure should include the appraisal of each increment of each function in comparison with an alternative method of providing that function. Finally, cost allocation to the several project functions should be based on the separable costs, remaining-benefits method which treat joint costs as residuals to be allocated to the various functions. The basic data for this method of cost allocation will be provided, to a considerable extent, by use of the marginal, "separable segments" method of project formulation. An appraisal of the several assumptions and policy recommendations of the Subcommittee will be presented in the following section.

In its report, the PWRPC includes a review and evaluation of the Subcommittee's work.[13] While recognizing the Subcommittee's contribution, the PWRPC offers two fundamental criticisms. It suggests that the Subcommittee errs both in overemphasizing the project rather than the basin program as the proper unit for analysis, and in concen-

[10] *Ibid.*, p. 7.
[11] *Ibid.*, p. 13.
[12] *Ibid.*
[13] PWRPC *Report*, Vol. I, pp. 55-56.

trating on economic (versus social) productivity, and primary (usually private) benefits flowing from the individual project. The PWRPC embraces these criticisms in its two main policy recommendations: first, that the basin program be taken as the proper unit for analysis; and second, that to attain the objective of public or social valuation, full accounting be made of secondary and intangible effects. The basic interrelationship and consistency of these two recommendations are indicated in the statement that "the public aspects of development are much more readily understandable on a regional pattern than for a single locality."[14] But, how adequate is the theory of the firm as an analytical base for evaluation of the public, multiple-purpose dimensions of water resource development?

Limitations of Existing Value Theory for Water Resource Development

The report of the Subcommittee of the FI-ARBC has been characterized as ". . . . by far the most thorough and expert job ever done on this phase of water resources policy."[15] As indicated above, the Subcommittee clearly stated the long-run, intangible aspects of the problem. Since it included in its study the application of current economic theory, we may assume that this is our best available statement of the relevance of the latter for the problem. The criticisms advanced by the PWRPC and its suggestions of a more fruitful approach provide indirect evidence of its skepticism with regard to the adequacy of the theoretical underpinnings of the Subcommittee's analysis, although the Commission itself makes no attempt to fill the gap.

It appears that there are at least three areas in which the Subcommittee's approach demonstrates the inadequacy of price theory for the problem of water resource development. First, since no identical substitute exists for a given multiple-purpose project unit, marginal analysis and market prices can only be applied to the incremental substitution of project components. Hence, in themselves, they seldom provide an adequate basis for judging the feasibility or desirability of such a project and are never adequate for analysis of the basin program as a whole. Second, even if the fundamental hiatus between social value and market price is ignored, the concept of market price becomes inadequate for the general problem of water resource evaluation when one considers the problem of imputing prices to secondary and intangible effects. Finally, no adequate basis is provided for appraisal and allocation of joint costs. In principle they are to be allocated on an "equitable" basis. This means, in the example presented by the Subcommittee, proportionate to the already identified separable costs.

The Subcommittee's preoccupation with conventional price theory and avoidance of a broader valuation concept can be explained on several grounds. Most important, perhaps, is the policy orientation of the Subcommittee. This is suggested by its recognition that ". . . .the practical problem of obtaining acceptance of these results limits the extent to which public viewpoint standards might be applied."[16] Also, after considering the problem of reflecting the interests of society as a whole through real cost and benefit evaluation, compared with monetary units, the Subcommittee concludes: "Unfortunately it is not practicable to establish and apply such a system of real value. There would be the technical difficulty of devising such a pattern upon acceptable assumptions, and furthermore, the administrators who recommend projects and legis-

[14] *Ibid.*, p. 60.
[15] *Ibid.*, p. 55.
[16] FI-ARBC, *Proposed Practices*, pp. 15-16.

lators who consider them would likely be averse to receiving project estimates couched in theoretical terms rather than in terms of expected dollar costs."[17]

Considering the practical nature of problems with which the FI-ARBC is confronted, there is justification for their limited, partial approach. This, of course, need not prevent those without such policy ties from wishing and working for more. Most important, their limited approach does not provide them with an analytical framework which their long-range public planning policy would appear to require. The second reason for the Subcommittee's failure to attempt a comprehensive development theory is evident in the first part of the above quotation—the problem of setting up workable or verifiable assumptions.

Posing this question exposes the heart of the problem of resource evaluation—the reconciliation of the inherent subjectivity of valuation, especially when considering public ends, and the practical need for some basis of objective quantification and measurement. Benefit-cost analysis is the means that is commonly used in water resource evaluation to reduce the infinite complexity of the problem to a summary statement.[18] Its effectiveness is limited to the degree of refinement with which the component benefits and costs can be measured or in some wise meaningfully included in analysis. The dangers inherent in the use of this type of analysis stem from ignoring its limitations and consequent uncritical acceptance of the final benefit-cost ratio. That the basic evaluation issues can be raised within the framework of this method indicates its flexibility as an analytical tool.

These issues may be discussed in terms of the classification of project effects into primary, secondary, and intangible benefits and costs. Primary benefits are commonly defined as those stemming from direct monetarily measureable products of a project. Secondary effects have been defined to include ". . . . the values added over and above the value of the immediate products and services of the project as a result of activities stemming from or induced by the project.[19] Intangible benefits mentioned by the FI-ARBC Subcommittee include: (1) from watershed treatment—assuring continued abundant food, fibre, and forest products and fire protection; (2) from electric power—better living and working conditions, reduced labor in home, increased leisure time, and conservation of exhaustible resources; (3) from recreation, fish, and wildlife—preservation of aesthetic, scenic, historic, and scientific values. Intangible effects include all those to which market values cannot be assigned. The problem of quantification and measurement in water resource evaluation thus involves the imputation of market values to secondary benefits and the discovery of a satisfactory basis for measurement of intangibles. If translation into either monetary terms or into some "real" physical equivalent are unsatisfactory in the evaluation of secondary and intangible project effects, the only alternative appears to be a full descriptive treatment, which is unavoidably subjective and imprecise.

The PWRPC feels that to translate public or intangible benefits into monetary terms would lead to over-evaluation of benefits by public agencies in order to

[17] *Ibid.*, p. 16.

[18] In benefit-cost analysis, benefits and costs stemming from a project over its estimated life are added. The ratio of their sums provides a first approximation of the feasibility of a given project. A review of the major issues in benefit-cost analysis is presented by Mark M. Regan and John F. Timmons in a paper published in *Water Resources and Economic Development of the West*, "Current Concepts and Practices in Benefit-Cost Analysis of Natural Resource Developments," (Committee on the Economics of Water Resources Development of the Western Agricultural Economics Research Council, 1955), Report No. 3, pp. 1-15.

[19] FI-ARBC, *Proposed Practices*, p. 9.

secure more favorable benefit-cost ratios. Thus it supports the Subcommittee's benefit classification and its recommendation that intangibles be evaluated in descriptive terms—thereby accepting the position that description will secure adequate treatment of intangibles. However, a contrary thesis seems at least equally defensible. It may be that, by setting the intangibles outside the formal analytical framework, operating agencies are encouraged to understate or ignore them in the process of evaluation.

The position of the PWRPC rests on two assumptions: (1) that all government agencies desire to maximize expenditures; (2) that this can be effectively accomplished by monetary evaluation because of legislative naivete concerning a favorable (monetary-based) benefit-cost ratio. The first assumption will not hold for all agencies, time periods, or individual administrators For example, technicians, especially engineers, may tend to ignore project elements that cannot be treated with apparent rigor.[20] The second assumption suggests the advisability of a more searching appraisal of the basic proposition of imputing prices to secondary benefits, for this lies safely within the Subcommittee's analytical framework, thereby tending to allay legislative query.

The classification of secondary, or indirect, effects on the basis of their measurability in market terms is of questionable validity when considered in operational terms. Imputation of prices to specific secondary effects may be so imprecise that the measurement has no more meaning than a similar imputation would have to intangibles. The difficulty of developing a workable analysis of secondary effects has led one writer to conclude that the effectiveness and repute of benefit-cost analysis would be best served by eliminating this element from the calculation.[21] Intangible, or extra-market effects, it is argued, should be retained in benefit-cost analysis, but the time and monies diverted from secondary benefit-cost evaluation could be most profitably spent on refining techniques for evaluating primary effects.

Since resources used in water development projects usually will have alternative uses from which secondary effects also would be derived, inclusion of such effects would be particularly subject to ad hoc appraisal. It is likely that in some cases such effects would best be set aside. In certain circumstances, however, they will be most important. For example, when water resource development occurs as a public works project in a period of unemployment, the impact of the employment multiplier becomes an important secondary effect. The basic argument here—that benefit-cost analysis should be as inclusive as possible—suggests that savings realized from non-evaluation of secondary effects should be devoted to greater refinement of the more difficult measurement and valuation problems rather than to sharpening the relatively adequate tools presently

[20] To cite one of many possible examples: "In determining the economic feasibility of the proposed interconnection consideration was given to the savings in (1) fuel costs . . . . (2) costs of firming secondary energy. . . . It is recognized that substantial other benefits would result; however, these have not been evaluated." United States Federal Power Commission, San Francisco Regional Office, *California-Oregon Interconnection*, March 1953, p. 61.

[21] S. V. Ciriacy-Wantrup, "The Role of Benefit-Cost Analysis in Public Resource Development," Water Resources and Economic Development of the West, Report No. 3, *op. cit.*, p. 27. For a discussion of the complexities and detail involved in this valuation problem see M. M. Kelso, "Evaluation of Secondary Benefits of Water-Use Projects," *Proceedings* Water Resource Development Committee of the Western Agricultural Economics Research Council, Berkeley, California (1953), pp. 49-62. A suggestive and stimulating study of this problem area is presented by Helmer C. Holje, Roy E. Huffman, and Carl F. Kraenzel, *Indirect Benefits of Irrigation Development*, Montana State College Agricultural Experiment Station Bulletin 517, Bozeman, Montana, March 1956.

available for treatment of primary project effects.[22]

As has been indicated, the difficulty of precise treatment of intangible effects may lead to their understatement as well as overstatement. The importance of such intangibles as conservative utilization of the nation's limited liquid fuel resource, and the growing importance of leisure and recreation, should suffice to substantiate the general position that there is no necessary correlation between the importance of problems and their amenability to quantification, or otherwise precise treatment. On the contrary, it would appear that in some instances, the less precise the materials or criteria, the greater the need for detailed analysis. Kuznets' statement concerning efforts to evaluate and quantify leisure as a component in national income accounting is applicable here: ". . . . the neglect or dismissal of these problems is likely to be more detrimental to the understanding of the process of economic growth than even crude attempts to deal with them."[23]

Prospective Gains from Refined and Comprehensive Benefit-Cost Analysis

Refinement of comprehensive water resource evaluation would result in more meaningful integration of secondary and intangible effects into the analysis. More adequate evaluation, in turn, would highlight the values foregone in failure to develop this resource, and set the scene for evaluation results sufficiently objective to merit general acceptance. With such status, formal studies could become the basis for defining the direction of optimum development rather than continuing indefinitely to play their present minor, secondary role.[24]

It would then be possible to think in terms of refinement and expansion of benefit-cost analysis. Refinement could be achieved, for example, by setting up a series of benefit-cost ratios for a given project that would clearly reflect the decreasing precision of the ratio as intangibles are added to the initial computation of primary project effects. Expansion of benefit-cost analysis to its logical limit would mean the application of this analytical approach to all public expenditures. Other government functions would become subject to economic scrutiny presently reserved for public resource development. In this way water resource development could take its proper place in the allocation of public funds to the gamut of government functions.

Finally, there is the possibility that improved techniques for evaluating water resource development in the United States might prove a useful stepping-stone toward more refined analysis of the general problem of development. Awareness of the fundamental significance of socio-cultural aspects of the undeveloped area problem is becoming increasingly

[22] Continued public policy support for inclusive evaluation is indicated in Senate Resolution No. 281, Sec. 4, *op. cit.*, "Requests for the authorization of projects . . . . should fully disclose the details and results of all studies and analyses of all potential utilizations, costs, allocations, payout, and benefits, both direct and indirect, made by all interested operating agencies."

[23] Simon Kuznets, "Long-term Changes in the National Income of the United States of America Since 1870," *Income and Wealth of the United States, Trends and Structure, Income and Wealth*, Series II (1952), p. 64.

[24] Though the existing techniques for multiple-purpose water resource evaluation in the United States are far from satisfactory, they apparently are superior in scope and design to methods applied elsewhere. In multiple-purpose hydroelectric developments in the USSR, costs and benefits relating to other than the primary purpose do not enter directly into project evaluation. John P. Hardt, *Economics of the Soviet Electric Power Industry* (Montgomery, Alabama: Air University, 1955), pp. 204-208. A survey of benefit-cost analysis procedures in western European countries several years ago indicated that such procedures were in a state of infancy compared to practices in this country. S. V. Ciriacy-Wantrup, "The Role of Benefit-Cost Analysis in Public Resource Development," *op. cit.*, p. 18.

general.[25] But this awareness has not been reflected, thus far, in any systematic, general treatment. The adequacy of existing welfare economics for this problem is subject to the same general line of questions which have been raised here relative to the limitations of the theory of the firm for water resource analysis. Improved analysis of social forces, perhaps a workable concept of social value, seems a prerequisite to effective analysis of the dynamics of economic development. Refined and broadened treatment of the benefits and costs of water resource development, in response to the goal of public welfare ends, could be a valuable step in this direction.

[25] To cite a few of the more recent examples: Francis L. K. Hsu, "Cultural Factors," *Economic Development Principles and Patterns*, Harold F. Williamson and John A. Buttrick, eds. (New York: Prentice-Hall, 1954), pp. 318-364; W. Arthur Lewis, *The Theory of Economic Growth* (Homewood, Ill.: Richard D. Irwin, 1955); Gunnar Myrdal, *An International Economy* (New York: Harper and Brothers, 1956); and Everett E. Hagan, "The Process of Economic Development," *Economic Development and Cultural Change*, April 1957, pp. 193-215.

Community Specialization in Durable and Nondurable Goods Manufactures

By ALBERT J. REISS, JR.*

MODERN urban communities differ in their industrial composition. Some communities are defined as specializing in one or more forms of economic production while other places are characterized as diversified or balanced economies. The predominant category of specialized function cities in modern urban economies is manufacturing centers. This is not surprising as in urbanized countries the single largest industrial employer (in condensed standard industry classifications) is manufacturing. For example, manufacturing with 25.9 percent of employed was the single largest industry group of all employed persons in the United States in 1950. The only other sizeable industry group of employers in the United States in 1950 was retail trade with 15.2 percent and agriculture with 12.2 percent of all employed persons.[1]

There is much speculation about the effect which specialization in manufacturing has on the structure of an urban place, although these speculations are largely confined to the popular trade literature. This problem was empirically investigated by the writer and the results are summarized below. The kind of manufacturing in which an urban place is specialized likewise is thought to affect its structure. The purpose of this paper is to describe some differences between communities specialized in durable goods manufactures with those specialized in nondurable goods manufactures. Tabular comparisons for all United States places and places specialized in manufacturing only are presented in an earlier work.[2]

There are no unambiguous theoretical or operational criteria for identifying functional specialization in a community. The position taken in this paper is that the functional specialization of a community is defined in terms of the *export activity* of that community. The export activity of a community involves the export of goods, services or capital to places of *extra-local demand*, with the source o payment lying beyond the limits of the economic community supplying the demand. The residual economic activity of a community supplies *local demand* and may be said to constitute the *maintenance activity* of a community. It maintains the physical city and its population at a particular level of living. Urban land economists and geographers refer to the export activity as the *economic base* of the community.[3] Some economists have formulated descriptions of the economic structural interrelations of metropolitan regions in the input-output frame of reference. These are only hypothetical descriptions, however, since neither the export nor the import data are available for any S. M. A. or urban place.[4] There are a few studies which describe in a

* Department of Sociology and Anthropology, Vanderbilt University. The financial support of the Institute of Research and Training in the Social Sciences of Vanderbilt University in the statistical clerical work of the project is gratefully acknowledged by the author.

[1] The above statistics are found in Table 55, *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, part I.

[2] Otis Dudley Duncan and Albert J. Reiss, Jr., *Social Characteristics of Urban and Rural Communities, 1950* (New York: John Wiley and Sons, Inc., 1956), Ch. 19.

[3] See the discussion, for example, by Richard B. Andrews, "Mechanics of the Urban Economic Base: The Problem of Terminology," *Land Economics*, August, 1953, pp. 263-268.

[4] See Walter Isard, R. A. Kavesh and R. E. Kuenne, "The Economic Base and Structure of the Urban Metropolitan Region," *American Sociological Review*, June 1953, pp. 317-321; and Walter Isard and Robert Kavesh, "Economic Structural Interrelations of Metropolitan Regions," *American Journal of Sociology*, September 1954, pp. 152-162.

gross way the export and maintenance activity of a particular urban area or complex.[5] Whenever the functional classification of a large number of places is undertaken, however, the data are employment or production statistics from national censuses.[6]

The difficulties in deriving valid estimates of the export activity of a community with census data are obvious. Recourse is made in this paper to operational constructs which rest only on *prima facie* evidence of export activity. A place is said to export durable or nondurable goods if it is within the upper decile of the distribution of places by percentage of employed persons in durable and nondurable manufactures, respectively. The percentile limits varied between 30 and 34 percent for large and small durable goods SMA's and independent cities and for large nondurable goods SMA's and independent cities, but the limits were only 23 and 26 respectively for small nondurable goods SMA's and independent cities. Size and metropolitan status are controlled in the operational definition of specialization because the composition of the population varies with these community attributes.

This paper compares the demographic economic and socio-economic morphology of communities specialized in durable goods and in nondurable goods manufactures. The question naturally arises whether the observed differences in morphological characteristics between groups of places are true differences in the sense that they are consistent for comparisons of individual places as well as for the comparison of group averages. The median test is used as a test of statistical significance to reduce the possibility of assuming there are differences between groups when, in fact, no real differences exist.[7] The use of this criterion of statistical significance increases the likelihood, however, that real, but small, differences are not detected, given the small sample izes.

Specialization in manufacturing is associated directly or indirectly with the economic, demographic and socio-economic composition of urban communities. Research has shown the following major differences between the structure of manufacturing communities and that of all urban places: (1) as employment in manufacturing increases, employment in all other major industries decreases, and vice versa; specifically, the percentage employed in transportation, public administration, government, finance, insurance, and real estate, medical and other health services, hotels and lodging places, and entertainment and recreation; and the per capita wholesale and retail sales are lower in manufacturing centers than in all places of comparable size and metropolitan status; (2) manufacturing increases male employment in the labor force; (3) manufacturing places have substantially smaller proportions of all

[5] Regional Plan Association, Inc., *The Economic Status of the New York Metropolitan Region in 1944* (New York, 1944); George H. Hildebrand and Arthur Mace, Jr., "The Employment Multiplier in an Expanding Industrial Market: Los Angeles County, 1940-47," *Review of Economics and Statistics*, August 1950; A. E. Jaffe, "Production-Maintenance Functions of the Working Force," (Mimeographed report, Columbia University: Bureau of Applied Social Research, 1952).

[6] Chauncy D. Harris, "A Functional Classification of Cities in the United States," *Geographical Review*, January 1943, pp. 86-99; Grace M. Kneedler, "Functional Types of Cities," *Public Management*, July 1945, pp. 197-203; Victor Jones, "Economic Classification of Cities and Metropolitan Areas," *The Municipal Yearbook*, 1953, pp. 49-57; John Fraser Hart, "Functions and Occupational Structures of Cities of the American South," *Annals of the Association of American Geographers*, September 1953, pp. 269-286; Howard J. Nelson, "A Service Classification of American Cities," *Economic Geography*, July 1955, pp. 189-210; J. H. Thompson, "A New Method for Measuring Manufacturing," *Annals of the Association of American Geographers*, December 1955, pp. 416-36; Gunnar Alexandersson, *The Industrial Structure of American Cities: A Geographic Study of Urban Economy in the United States* (Lincoln: University of Nebraska Press, 1956).

[7] For a detailed description of the median test, see A. E. Mood, *Introduction to the Theory of Statistics* (New York: McGraw Hill, 1950) p. 394-398).

white-collar and manual workers other than craftsmen, foremen and kindred, and operative and kindred workers; (4) the median income level of manufacturing places is above that of all places of comparable size and metropolitan status.[8] The demographic composition of manufacturing places is quite similar to that for all places except that the populations in manufacturing centers are residentially more stable and the average household is larger.[9]

There is marked regional concentration in the location of SMA's or urban places classified as manufacturing centers. Nine out of every ten places specialized in manufacturing are in a Northeast or North Central State; one out of two is in the Northeast.[10] This pattern is only generally true of the location of places specialized in the durable and nondurable goods sub-groups of manufacturing. While nine of every ten durable goods places are located in the Northeast or North Central regions, three of every five are located in the so-called "industrial heartland," the North Central region. And, although one of every two places specialized in nondurable goods manufactures in 1950 was located in the Northeast, one of every three was located in the rapidly urbanizing South.[11] The pattern of location of places specialized in durable and nondurable goods manufactures in 1950 is so dissimilar in fact, that 46 percent of the specialized nondurable goods places would have to be in another region to make their regional distribution the same as the one for places specialized in durable goods manufactures.

Specialization in a particular economic function can affect the social morphology of the community either directly or indirectly. The direct effects are a consequence of the employment opportunities the industry affords, the demographic and social characteristics of its labor force, and the social organization of the employing establishment. Industry specialization can have a large number of indirect effects on community morphology. Most of these occur, however, through a nexus of economic activity created by the way in which manufacturing affects the remaining industry composition of the community; manufacturing centers are not generally linked in location with other forms of economic specialization.

Demographic Composition

Nondurable goods manufactures as a class are more favorable to the employment of women than are the combined durable goods industries; in 1950, 35.5 percent of employed persons in nondurable goods industries were women as compared with only 17.7 percent in durable goods industries.[12] These differences in male and female employment opportunities should have a direct effect on the sex composition and labor force participation rates of the population in durable and nondurable goods places. One would predict that places specialized in durable goods manufactures when compared with places specialized in non-

[8] A detailed discussion of these findings is to be found in Chapters 17 and 19 of Otis Dudley Duncan and Albert J. Reiss, Jr., *Social Characteristics of Urban and Rural Communities, 1950* (New York: John Wiley & Sons, Inc., 1956).

[9] *Ibid.*, p. 345.

[10] The regional location of manufacturing is well documented. See, for example, C. F. Jones, "Areal Distribution of Manufacturing in the United States," *Economic Geography*, July, 1938, pp. 217-222; C. D. Harris, "Market as a Factor in the Localization of Industry in the United States," *Annals of the Association of American Geographers*, December, 1954, pp. 314-348; J. H. Thompson, "A New Method for Measuring Manufacturing," *Annals of the Association of American Geographers*, December 1955, pp. 416-436. Otis Dudley Duncan and Albert J. Reiss, Jr., *op. cit.*, pp. 253-54; Gunnar Alexandersson, *The Industrial Structure of American Cities*, *op. cit.*, pp. 27-91.

[11] See J. J. Spengler, "Regional Differences and the Future of Manufacturing in America," *Southern Journal of Economics*, April 1941, pp. 475-493.

[12] Based on data in Table 55, *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Part I.

durable goods manufactures will have higher sex ratios (males per hundred females) and male labor force participation rates, and lower female labor force participation rates. These predictions are largely confirmed in Table I. The sex ratio differences are remarkably consistent in individual comparisons. Sex ratios in durable goods centers, in fact, are greater than those for all United States places of comparable size and metropolitan status while the ratios for nondurable goods centers are below those for all comparable United States places. The labor force participation rate of women generally is well below that of all United States places in durable goods centers while it is substantially

TABLE I—Sex Ratios and Labor Force Participation of Males and Females, for Selected Standard Metropolitan Areas and Independent Cities of 10,000 Population or More, By Type of Functional Specialization in Manufacturing, by Size of Place: 1950

Metropolitan Status and Size of Place	Mfg. Specialization	Sex Ratio	Labor Force Participation Rates	
			Male	Female
S. M. A.'s				
50,00 to 250,000	Durables	99.6*	82.7*	30.8*
	Nondurables	93.0	78.1	38.7
250,000 or over	Durables	99.3*	77.2	27.7
	Nondurables	95.6	78.5	32.1
Independent Cities				
10,000 to 25,000	Durables	94.2*	81.9	32.6*
	Nondurables	92.0	81.3	38.4
25,000 to 50,000	Durables	95.2*	82.3	33.1*
	Nondurables	89.1	77.4	39.9

Source: 1950 *U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Parts 2 to 50, tables 33 and 34.
(Asterisk (*) denotes difference between durable and nondurable groups is significant at the 0.05 level of probability)

above the United States average for all nondurable goods centers except for large SMA's.

Economic Characteristics

The location of a manufacturing establishment affects not only the social morphology of the urban community in which it is located, but also that of nearby places, by providing employment opportunities to their residents. The use of the operational criterion of percentage of employed in manufacturing resident in a place means that a place may be called specialized in manufacturing even though the employing manufacturing establishments are not located within its boundaries. Comparisons of the economic composition of places specialized in durable and nondurable goods are somewhat affected by this discontinuity between residence and workplace. Operationally, the economic composition of areas with different types of residents employed in manufacturing is compared. The fairly close correlation of workplace and residence means, however, that the immediate environs, if not the

actual SMA or urban place, generally conditions this residence pattern.

Manufacturing accounts for a sizeable proportion of the employed in specialized durable and nondurable goods communities as Table II shows. This is true even when the urban agglomeration is very large. The percent of employed in durable goods is at least 37 percent of all employed in specialized durable goods places, regardless of size and metropolitan status. The percent of employed in nondurable goods likewise is high in specialized nondurable goods places. The percent of employed in durable goods is

TABLE II—PERCENTAGE OF EMPLOYED PERSONS IN DURABLE AND NONDURABLE GOODS MANUFACTURES, FOR SELECTED STANDARD METROPOLITAN AREAS AND INDEPENDENT CITIES OF 10,000 POPULATION OR MORE CLASSIFIED AS SPECIALIZED IN DURABLE OR IN NONDURABLE GOODS MANUFACTURES, BY SIZE OF PLACE: 1950

Metropolitan Status and Size of Place	Durable Goods Mfg.		Nondurable Goods Mfg.	
	Percent of employed persons in—			
	Durables	Nondurables	Durables	Nondurables
S. M. A.'s				
50,000 to 250,000	40.5*	8.2	7.0*	39.6
250,000 or more	37.3*	6.9	16.0*	26.8
Independent Cities				
10,000 to 25,000	39.9*	9.0	7.0*	41.2
25,000 to 50,000	40.3*	8.2	8.8*	36.0

Source: *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Parts 2 to 50, table 35.
(Asterisk (*) denotes difference between durable and nondurable groups is significant at the 0.05 level of probability).

somewhat greater in specialized durable goods centers, however, than is the percentage of employed in nondurable goods in specialized nondurable goods places. This difference is not altogether reflected in a greater volume in the corollary type of manufacturing, although somewhat more of the durable goods centers than that of the nondurable goods centers also are classified as manufacturing centers in this study. Looked at another way, this difference is largely, but not entirely, a function of differences in the relative size of the manufacturing employed in the two types of manufacturing community. (See Table II) Furthermore, this difference is not to any sizeable degree affected by either the over-all durable-nondurable composition of manufacturing or by the relationship of manufacturing location to size of place. There are 45.6 of all manufacturing employed in durable goods[13] and the urbanization index of durable goods is roughly equal to that of nondurable goods.[14] This means then that nondurable goods tends to locate in a somewhat larger number of places than does durable goods manufacture—a fact often assumed.

Previous research demonstrates that specialization in manufacturing generally precludes specialization, or a substantial development of employment, in a nonmanufacturing industry.[15] This is also

[13] *Ibid.*

[14] Based on data in Table 35, *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Parts 2 to 50.

[15] Duncan and Reiss, *op. cit.*, pp. 258-265.

true for specialization in durable and in nondurable goods manufactures. For both SMA and independent city size of place groups, employment in government; public administration; transportation; finance, insurance and real estate; medical and other health services; hotels and lodging places; and entertainment and recreation services is below that of the average United States place in both durable and nondurable goods centers. Further comparisons appear to warrant the conclusion that specialization in a nonmanufacturing industry is about equally improbable in durable and nondurable goods centers.

A community may specialize in more than one form of economic activity. The following types of economic specialization were defined in a separate study; trade specialization in wholesale trade only, retail trade only, and in wholesale and retail trade, and the minor types of economic specialization in higher education; military; entertainment and recreation services; finance, insurance and real estate; and medical and other health services.[16] A separate tabulation of the location of the minor types of economic specialization in durable and in nondurable goods centers shows that neither durable nor nondurable goods centers are very likely to support a minor form of economic specialization. No SMA which specialized in durable goods and only four independent cities specialized in durable goods manufactures were also the locus of a minor form of specialization. Nondurable goods centers were somewhat more likely to support a minor form of economic specialization than were durable goods places, although only a negligible proportion of all nondurable goods centers are involved. Both durable and nondurable goods centers are much more likely to specialize also in trade than in a minor form of specialization. This is surprising since the possibility of specializing in a single minor form of specialization is greater than the possibility of specializing also in trade. The extent of multiple specialization, of course, varies with the metropolitan status and size of a place because the expected percentage of specialization varies by definition with metropolitan status and size. Nonetheless, in the largest numerical group of places—small independent cities—16 percent of all durable goods and 18 percent of all nondurable goods places were specialized also in retail trade, wholesale trade, or in both. Nondurable goods centers are more often specialized also in trade than are durable goods centers, except for large SMA's. The general description then of the linkage of manufacturing with other forms of specialization is that nondurable goods centers are more likely to link manufacturing with other forms of economic specialization than are durable goods centers. But there is substantial linkage only with trade in both durable and nondurable goods centers and relatively little linkage with the minor forms of economic specialization.

Socio-Economic Status

The occupational structure of durable and nondurable goods centers is expected to differ since the occupational composition of durable goods differs from that of nondurable goods. There are substantial industry differences in occupational composition for males in the managerial sales, craft and unskilled laborer occupations. Comparing the occupational structure of durable and nondurable goods employment, nondurable goods

[16] See Duncan and Reiss, *op. cit.*, Chapter 16 for a definition of all but the last two types. The last two types are defined according to the same criteria applied to the minor types of specialization. Percent of employed in the industry is the operational definition for these minor types of specialization; placement in the upper decile of the distribution defines a minor type of specialized place.

has an excess of 2.7 percent males in the manager, official and proprietor occupations, and 4.5 percent in sales, while durable goods has an excess of 6.6 percent in the craftsmen, foremen and kindred worker occupations, and 4.5 percent of laborers. Nondurables also employ 2.9 percent more operatives and kindred workers. These occupation group differences result in an overall excess of 7.5 percent in the manual occupations in durable goods.[17]

Differences in the occupational composition of durable and nondurable goods are more striking for female employment, however. Durable goods employs an excess of 17.6 percent in sales, clerical and kindred occupations as compared with nondurable goods while nondurables show an excess of 18.2 percent in operative and kindred worker occupations.[18] The occupational structure of durable and nondurable goods centers then should exhibit these differences unless other aspects of community morphology mask the differences.

Table III presents comparisons of the major occupation group composition of males in durable and nodurable goods centers. Specialization in durable goods compared with nondurable goods, as predicted, affects the occupational structure of durable goods places by providing an excess of male craftsmen, foremen and kindred workers in durable goods centers. The actual size of the difference appears, in fact, to be roughly that expected on the basis of the differences in occupational composition of durable and nondurable goods. The inference is based on the following procedure: The proportion of craftsmen, foremen and kindred workers among all United States males employed in durable goods in 1950 was 0.2761, and the proportion in all other industries, except mining, agriculture, forestry and fishing, was 0.2092. Then for the case of SMA's with 50,000 to 250,000 inhabitants specialized in durable goods manufactures and having 53.4 percent of all males employed in durable goods and 46.6 in all other industries, it would be expected that the percentage of craftsmen, foremen and kindred workers would be $(0.2761)+(46.6)=24.5$ percent. By actual count, in Table III, 24 percent of the employed males in this group of SMA's are in craftsmen, foremen and kindred worker occupations; hence, the actual proprotion falls short of the "expected" proportion by only a half of one percent. This is a fairly rough standardization procedure so that differences of roughly one percent, or less, are interpreted as meaning there is no real difference between the actual and "expected" percents. For this case, then, we could conclude that the occupational structure of small SMA's specialized in durable goods shows a high percentage of employed in craftsmen, foremen and kindred worker occupations because of the relatively high proportion of craftsmen, foremen and kindred worker jobs in durable goods industries. This kind of analysis is followed for each major occupation group in Table III.

The actual proportion of craftsmen, foremen and kindred workers in durable goods centers is about that predicted, given the occupational composition of durable goods manufactures, with the possible exception of small independent cities. The actual proportion of craftsmen, foremen and kindred workers in nondurable goods centers is less than that expected, given the proportion of craftsmen, foremen and kindred workers in nondurable goods manufactures, for small SMA's and for all independent cities. This suggests that in these centers special-

[17] Based on data in Table 6, *1950 U. S. Census of Population*, Vol. IV. *Special Reports*, Part I, Chapter D, "Industrial Characteristics," 1955.

[18] *Ibid.*

ization in nondurable goods exerts an indirect influence on the remainder of the community's structure, such that other industries in the community employ relatively smaller proportions of craftsmen, foremen and kindred workers than does the "average place."

The predicted difference of a higher proportion of male laborers in durable goods centers is not observed for two of the metropolitan status and size groups and is statistically significant for none of the four comparisons. This means that there are indirect effects of specialization

TABLE III—Percentage of Employed Males in Selected Major Occupation Groups, for Selected Standard Metropolitan Areas and Urban Places of 10,000 Population or More, By Type of Manufacturing Specialization, By Size of Place: 1950
(Farm Occupation and Occupation Not Reported are Omitted)

Selected Major Occupation Groups and Type of Manufacturing Specialization	Metropolitan Status and Size of Place			
	S. M. A.'s		Independent Cities	
	50,000 to 250,000	250,000 or more	10,000 to 25,000	25,000 to 50,000
Professional, technical and kindred workers				
Durables	6.7*	7.7	7.0*	7.0
Nondurables	5.6	7.3	7.6	6.2
Managers, officials and proprietors, except farm				
Durables	9.5	9.2	10.2	10.9
Nondurables	10.2	10.1	11.2	11.8
Clerical and kindred workers				
Durables	6.6	7.6*	6.5*	7.2*
Nondurables	5.8	6.9	6.0	6.3
Sales workers				
Durables	5.7*	6.0	6.1	6.8
Nondurables	7.1	6.5	6.8	7.9
Craftsmen, foremen and kindred workers				
Durables	24.0*	23.3*	22.2*	23.5*
Nondurables	20.0	21.6	19.8	19.2
Operatives and kindred workers				
Durables	28.8	28.3	28.6	30.1
Nondurables	31.9	29.8	31.9	31.1
Private household and service workers				
Durables	5.3*	5.9	5.8	6.5
Nondurables	6.9	6.3	6.7	7.2
Laborers, except farm				
Durables	7.3	9.1	8.0	6.6
Nondurables	7.6	7.7	7.8	7.3

Source: *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Parts 2 to 50, table 35.
(Asterisk (*) denotes difference between durable and nondurable groups is significant at the 0.05 level of probability.)

in durable and/or nondurable goods manufactures which mask the expected difference in employed as male laborers. Actually, specialization in both durable and nondurable goods probably has an indirect effect on the employment of male laborers in the community since the actual percent of male laborers in durable goods centers is clearly below that expected from the occupational composition of durable goods manufactures among the four metropolitan status and size groups. The actual percent of male laborers in nondurable goods also appears as less than that expected though the differences are not as great as for durable goods. The expected difference in percent of male laborers between durable and nondurable goods centers thus is greater than the actual difference.

Nondurable goods centers, as predicted, have a higher proportion of male managers, officials and proprietors, and of male sales workers than do durable goods centers. The differences are statistically significant only for small SMA sales worker comparisons, however, suggesting that the composition of other industries in the specialized community affects comparisons. The actual percent of male proprietors, managers and officials in both durable and nondurable goods centers is roughly that expected from the occupational composition of durable and nondurable goods manufactures, except large independent city comparisons. The actual difference between durable and nondurable goods centers, in fact, is roughly equal to the expected difference. The divergence of the expected proportion from the actual proportion of male sales workers in both durable and nondurable goods centers is fairly small. The difference between actual and expected proportions is positive for all four durable goods comparisons and negative for all but large independent city nondurable goods comparisons, thereby reducing the actual difference between durable and nondurable goods centers somewhat over that expected.

It is predicted also on the basis of occupational composition of durable and nondurable goods manufactures that nondurable goods centers will have a somewhat greater proportion of male operatives and kindred workers than will durable goods centers. The data for the four metropolitan status-size groups of places are consistent with this prediction but the results are not statistically significant for individual comparisons. It is not surprising that the differences are not significant since nondurable goods centers are expected to have roughly the same proportion of male operative and kindred workers as do durable goods centers. The major reason why there is little difference in the expected proportions of operative and kindred workers in durable and nondurable goods centers, despite the difference in occupational composition of durable and nondurable goods, is that the percent of employed males in durable goods in durable goods centers is on the average 10 percent greater than is the percent of employed males in nondurable goods in nondurable goods centers. This disproportion of males employed in durable compared with nondurable goods centers cancels out the morphological effect of small differences in occupational composition favorable to nondurable goods.

There is little difference in the proportion of male professional, technical and kindred workers, clerical and kindred workers, and private household and service workers in durable compared with nondurable goods; therefore, these occupations are not expected to differentiate durable from nondurable goods centers. Some significant differences in

the proportion of men in these occupations are observed, nevertheless, between specialized durable and nondurable goods places. Durable goods specialization apparently exerts an indirect effect on the structure of these cities such as to increase the proportion of male clerical and kindred workers above that expected and relatively greater than that actually in nondurable goods centers. The results are not as clear for the male professional, technical and kindred worker groups since there are significantly more of these persons in small independent cities specialized in nondurable goods but significantly fewer in small SMA's specialized in nondurable goods. The source of these indirect influences is not clear. The excess of male private household and service workers in nondurable goods centers is undoubtedly related to differences in the regional location of the two types of centers. More of the nondurable goods centers are located in the South where employment is generally more favorable to male service workers. This apparently is not the sole reason, however, since the occupational differences are least evident for independent cities—the group in which the regional differences in the location of durable and nondurable goods centers are most marked.

The predicted differences in the occupational opportunities for women in durable and nondurable goods centers are affirmed in Table IV. There are significantly more women in sales and in clerical and kindred work in durable goods centers and significantly more women in operative and kindred worker occupations in nondurable goods centers, regardless of metropolitan status and size of place. The differences are the most substantial ones observed for this study, suggesting that the most striking difference in the effect of specialization in durable as compared with nondurable goods manufactures is on the occupational oportunities for employed women. There are from 5 to 11 percent more employed female clerical and kindred workers and from 2 to 3 percent more employed female sales workers in durable compared with nondurable goods for specialized places in the metropolitan status and size of place groups compared in Table IV. For the same comparisons, nondurable goods places show an excess of 11 to 21 percent of female operative kindred workers. There are no signifi-

TABLE IV—Percentage of Employed Females in Selected Major Occupation Groups, for selected Standard Metropolitan Areas and Independent Cities of 10,000 Population or More, by Type of Manufacturing Specialization, by Size: 1950

Metropolitan Status and Size of Place	Clerical and Kindred Workers		Sales Workers		Craftsmen, Foremen and Kindred Workers		Operatives and Kindred Workers		Private Household and Service Workers	
	Durables	Nondurables	Durables	Nondurables	Durables	Nondurables	Durables	Nondurables	Durables	Nondurables
S. M. A.'s										
50,000 to 250,000....	28.4*	17.4	9.5*	6.3	1.9	1.5	24.7*	44.4	16.1*	12.4
250,000 or more.....	27.9*	23.6	9.4*	7.6	1.6	2.0	17.9*	37.3	18.9*	13.3
Independent Cities										
10,000 to 25,000.....	25.2*	20.0	9.7*	7.7	2.9	1.5	26.4*	37.7	17.8	17.4
25,000 to 50,000.....	26.4*	18.6	10.4*	7.3	1.8	1.2	27.4*	39.3	17.2	18.1

Source: *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Parts 2 to 50, table 35.
(Asterisk (*) denotes difference between durable and nondurable goods is significant at the 0.05 level of probability)

cant differences in the percent of female craftsmen, foremen and kindred workers in durable as compared with nondurable goods centers.

The percent of female private household and service workers is significantly greater in durable than in nondurable goods SMA's. This is contrary to expectations based on differences in the regional location of the two types of places.

The socio-economic status level of manufacturing places is generally lower than that of nonmanufacturing places, or of all United States places, if occupation is taken as a measure of status.[19] The percent of employed males in manual occupations in fact is well above that of the average United States place for both durable and nondurable goods centers. There is relatively little actual difference in the manual worker composition of durable and nondurable goods centers, however, despite the fact that 80.9 percent of all employed males in durable goods manufactures compared with 73.4 percent of all employed males in nondurable goods are manual workers. Durable goods centers thus should show an excess of 7.5 percent in manual occupations over nondurable goods centers but this difference is not apparent. Other industries in these communities and the relative differences in male employment in durable and nondurable goods mask the difference. Similarly, one would predict that the population of durable goods centers will have a generally higher median income than nondurable goods centers since the median income of 1949 of both the experienced male and female employed is greater in durable than in nondurable goods manufactures.[20] The difference in median income is substantial only for women; the average income of women in durable goods manufactures in 1950 was over $300 more than the average income of women in nondurable goods. The data in Table V affirm the expectation of differences in median income. The median income of families in durable goods centers is significantly greater than that in nondurable goods centers. The average family income in durable goods centers, in fact, is several hundred dollars above that of the average United States place. The average family income in nondurable goods places generally is roughly that of the average United States place in large SMA's, somewhat below in small SMA's, and above in independent cities.

The somewhat higher average family income in durable goods places may account for the generally larger proportion of home owners in durable as compared with nondurable goods places. These owner-occupancy differences in Table V are substantial and significant for all comparisons. The guess that differences in employer-owned housing might account for the observed differences in owner-occupancy offers an explanation which hardly would seem to account for the differences between small SMA durable and nondurable goods places. The higher average family income does not seem to account for much of the difference in owner-occupancy—a difference as large as 10 percent for the independent cities.

The educational level of persons 25 years of age and over is significantly greater in durable than in nondurable goods small SMA's and in independent cities. These differences go contrary to expectations based on the occupational composition of durable and nondurable goods industries. Durable goods manufactures employ proportionately fewer white-collar workers (for whom the average education is assumed to be greater

[19] See Duncan and Reiss, *op. cit.*, pp. 265-271.

[20] Based on data in Table 136, *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Part I.

than for manual workers) than do nondurable goods. Nondurable goods centers, in fact, generally show higher proportions of the more highly educated managers, officials and proprietors, and of sales workers, while durable goods centers have higher proportions of the least educated common laboring group in our society. The higher educational level of durable goods centers is consistent, however, with the observation that durable goods centers show proportionally more professional, technical and kindred workers than do nondurable goods workers.

Summary and Conclusions

This paper examines the relationship between specialization in type of manufacturing, whether durable or nondurable goods manufactures, and the demographic, economic and socio-economic structure of communities so specialized. The relationship is measured by comparing groups of S.M.A.'s and urban places in the upper quintiles of the percentages of employed persons at work in durable and in nondurable goods manufactures.

There, of course, is substantial difference between the specialized manufacturing community and the average United States place. Manufacturing places show much larger proportions of manual workers, particularly of operatives and kindred workers, and the median income of families and unrelated individuals is greater in manufacturing places because of the truncated occupation distribution of manufacturing when compared with that of all places. Manufacturing also substantially increases the male labor force participation rate.

These characteristic community patterns of manufacturing specialization are substantially influenced by the fact that

TABLE V—Summary Statistics of Income, Educational Attainment, and Owner-Occupancy of the Population, for Selected Standard Metropolitan Areas and Urban Places of 10,000 Population or More, by Type of Manufacturing Specialization, by Size of Place: 1950

Metropolitan Status and Size of Place	Median Income of Families and Unrelated Individuals in 1949[1] (in dollars)		Median School Year Completed[2]		Percent of Occupied Dwelling Units Owner-Occupied	
	Mfg. Specialization		Mfg. Specialization		Mfg. Specialization	
	Durable	Non-durable	Durable	Non-durable	Durable	Non-durable
S. M. A.'s						
50,000 to 250,000.....	3,291*	2,668	10.0*	8.7	62.4*	46.2
250,000 or more.....	3,251*	2,999	9.7	9.7	60.1*	55.1
Independent Cities						
10,000 to 25,000.....	3,020*	2,640	10.1 *	9.1	60.1*	49.4
25,000 to 50,000.....	3,190*	2 899	9.8*	9.4	58.2*	48.8

[1] The figure shown is the one for the median place in each group..

[2] Persons 25 years old and over. The figure shown is the one for the median place in each group.

Source: *1950 U. S. Census of Population*, Vol. II, *Characteristics of the Population*, Parts 2 to 50, table 34; *1950 U. S. Census of Housing*, Vol. I, *General Characteristics*, Part I, U. S. Summary, table 22, and Parts 2 to 6, table 1.

(Asterisk (*) denotes difference between durable and nondurable groups is significant at the 0.05 level of probability)

as manufacturing employment in a community increases, employment in all other industries decreases. Both specialized durable and nondurable goods places generally exhibit the major morphological characteristics of manufacturing centers. At the same time, however, durable goods centers are more likely to "set the pattern" for all places specialized in manufacturing than are nondurable goods places. The percentages of manual workers are greater in durable goods places, the average income is higher, and they are less likely to support minor forms of economic specialization and of trade than are nondurable goods places.

The most substantial effect on community morphology which differences in type of manufacturing employment produce apparently comes about as a direct consequence of a single fact—nondurable goods industries are more favorable to the employment of women than are durable goods industries. This fact is closely tied to the technological-occupational requirements of the durable and nondurable goods manufactures. The specific differences in occupational composition—that durable goods centers show an excess of craft and laborer occupations, while nondurable goods show an excess of manager (official and proprietor) of sales, and of operative and kindred workers, though the differences are not always significant by the rather rigorous test used in this study—are a cause and an effect of these technological-occupational requirements. The higher median income of durable goods places, their higher sex ratios and male labor force participation rates, and their lower percentages of males married, all reflect the relatively lower female employment in durable goods.

Production Goals for Forestry

By G. R. GREGORY*

THE single fact that nearly one-fourth of the nation's land area is forested is sufficient to make forest policy decisions significant to students of land use. The thousands of different ways in which wood is used today, the ability of wood to substitute for certain stock resources, the relationships between forests and other natural resources —especially between forests and water —all greatly enhance the importance of the nation's forest land. Forest policy decisions are key decisions in the natural resource field. Yet before sensible forest policy can be established, some answer to the question "How much wood should we grow?" must be at hand.

Early goals for national timber production required little analysis; a goal of *more growth* was adequate for the times and could be supported by simply comparing growth with cut. A new type of goal appeared with the publication of *A National Plan for American Forestry*[1] in 1933. Its basic concept, "requirements," was subsequently defined as "the quantity of timber products that might be used by consumers afforded reasonable latitude in choice of readily available materials, including timber products, in a national economy functioning at a high level of employment and output."[2] While quantitative goals have been revised periodically as new data became available, the basic framework for forest growth goal formulation has remained essentially unchanged.[3]

In a 1952 article, Vaux and Zivnuska reviewed the then-current growth goal concept.[4] Four major deficiencies of Forest Service growth goal work were disclosed: (1) future timber prices were assumed at much too low a level; (2) all other prices were assumed to remain at the same relative level as during the chosen base period; (3) constant production costs were implied; and (4) the model was static. The two authors proposed that growth goal models "must provide a solution . . . . in which the optimum level of production for any future date is estimated simultaneously with estimates of the optimum level of production at all other future dates."[5]

The primary objective of this article is to present such a model. Developed specifically with reference to forest growth goals, it may also be useful in deriving and analyzing production goals for other types of products.

II

A production goal is an output schedule that permits attainment of some basic aim of management. Forest growth

* George Willis Pack Associate Professor of Resource Economics, School of Natural Resources, University of Michigan.

[1] U. S. Congress, Senate, *A National Plan for American Forestry*, 73rd Congress, 1st Session, S. 12, (Washington: 1933), 2 vols.

[2] U. S. Forest Service, *Potential Requirements for Timber Products in the United States*. Report 2 from *A Reappraisal of the Forest Situation* (Washington: 1946), p. 1.

[3] Since preparation of this article the Forest Service has released its new analysis, U. S. Forest Service, *Timber Resources for America's Future* (Forest Resource Report Number 14, Washington, D. C., 1958). While this represents a forward step in many respects, the growth goals remain, essentially, forecasts of future consumption based on historical trends. The possible effect of price change on future timber consumption is explicitly recognized by the presentation of three estimates, derived by assuming first stable, then rising, timber prices. The brief enumeration of difficulties confronting anyone attempting the derivation of statistical timber demand functions indicates consideration of this possibility. Initial examination, however, reveals no detailed consideration of the important production cost aspects nor of the ultimate necessity of concurrent demand-supply analysis before logical production goals can be established.

[4] Henry Vaux and John Zivnuska, "Forest Production Goals: A critical analysis," *Land Economics*, November 1952, p. 318-327.

[5] *Ibid.* p. 326.

goals are schedules of proposed forest growth that must be met if more basic aims are to be realized. Such goals provide quantitative objectives which permit assessment of the productive effort to be devoted to forestry. Given proper management, our forests can provide a constant or increasing stream of raw materials for human satisfaction. But to achieve this requires that forest managers consider the impact of today's decisions on future production for the actions taken today greatly influence tomorrow's wood production possibilities. Growth goals formulated in a way that takes these time interdependencies into account can be important guides to managerial as well as to national policy decisions.

III

Two physical peculiarities of forest production seem of particular significance to the problem of growth goal formulation. The first of these is the unusually long time period involved in stumpage production: at least 15 years are required to grow pulpwood while sawtimber seldom takes less than a half century. An additional complication arises from the time lags associated with various forest operations. Thirty or more years, for example, may elapse between the pruning of a forest stand and its harvest.

The second peculiarity might be expressed by saying that standing timber is at once the "factory" and the final product. Each tree in a forest continues to lay on rings of wood until it is harvested. The act of cutting destroys a part of the forest factory—changes the growing stock with which the forest manager works—so that forestry is characterized by relationships between present harvest and future production.

The most significant institutional factor would seem to be the area and ownership of American forest land. Briefly, the essential facts are these: There are about 484 million acres of commercial forest land in the United States and changes are expected to be relatively small. Nearly three-fourths of the commercial forest land is in private ownership. About 26 percent of this privately-owned land is in holdings exceeding 5,000 acres, controlled by some 2,600 individual owners. The remaining 74 percent of the private forest land, in holdings of 5,000 acres or less, is controlled by some 4½ million owners. Of the publicly-owned commercial forest land (one-fourth of the total) federal agencies administer over 75 percent, state and local governments the remainder. Nearly two-thirds of the commercial forest area under public control is in National Forests.

The ownership pattern is significant because it determines to a considerable degree the competitive nature of stumpage production. The many owners, the ease of entry into the sawmilling business, and the fact that stumpage is sold for a variety of purposes, all point toward a model based on assumptions of pure competition. And, because of the relative fixity of the forest land area, the model must be of a short-run nature even though the problem entails long time spans. A short run of fifty years' duration may seem an anomaly, but it is not unusual in forestry.

The two physical peculiarities referred to earlier also serve to establish conditions for any realistic model. Although technically a short-run model, it must still be capable of dealing with long production periods and of handling the time-lags associated with forest production. And because of the dual nature of standing timber, the model must permit the time interdependencies of forest growth and harvest to be recognized.

The fact that 75 percent of all commercial forest land is privately owned suggests that growth goals might well have a profit maximizing objective. The suitability of such an objective for national goals will be discussed later: for the present at least, profit maximization will be accepted as the basic objective. And, since profits will be greatest over time when the present net worth of a property is maximized, a growth goal for an individual forest property can be defined as the particular pattern of stumpage output that will maximize the present net worth of the forest. Similarly, the national growth goal will be defined as the pattern of stumpage output over time that will maximize the present net worth of the nation's forest land.[6]

IV

Basically, the models stem from the work of Hicks[7] who, utilizing previously-developed joint product theory, evolved what he called a "dynamic" methodology. Whether the method should be termed "dynamic" or not is open to question, but the procedure seems particularly appropriate to problems involving time interdependencies and in this connection has received considerable attention.[8]

A specific *period* of analysis is decided upon and divided into a number of *intervals*. A *period* of 50 years, for example, might be divided into five ten-year *intervals*. The output of each interval is then viewed as a separate product produced jointly with the output of the other intervals. Because the interval outputs are produced jointly through time the term "time jointness" has seemed appropriate. Placed in this time jointness framework, the growth goal problem becomes one of determining the combination of periodic stumpage outputs that will maximize the present net worth of the forest area being considered.

V

The model for an individual forest growth goal can be separated into three major parts: a set of supply relationships, a set of demand relationships, and a process for integrating the two. Each will be treated in turn, beginning with the supply problem.

Outputs for any given interval can be changed by changing the inputs—by varying (in this case) the inputs of planting, fire protection, thinning, pruning, weeding, insect control, etc. The physical information required is obviously that implied by any production function, and can be expressed by a generalized equation such as:

$$Q_s = f(A, B, C, \ldots\ldots, K)$$

where A, B, C, ... K are the inputs, and Q_s the stumpage output.

Future forest output will be affected by the timing of inputs as well as by their quantity. The output of the fifth interval, for example, may depend even more upon the inputs of the preceding four intervals than upon the inputs of the fifth. Furthermore, the output of future intervals may be highly dependent upon the harvest (or output) of preceding intervals. In addition to the input-output relationships over time, therefore, the relationships between outputs of various intervals must be specified. Using the same symbols as above, and denoting

[6] The goal of maximizing present net worth is dependent to a considerable extent upon the previously-made assumption of pure competition. Under other assumptions this might not be a suitable goal.

[7] J. R. Hicks, *Value and Capital*, 2nd edition (London: Oxford University Press, 1946), 340 pp.

[8] See especially Sune Carlson's *A Study in the Pure Theory of Production* (London: P. S. King and Sons, Ltd., 1939) and Ciriacy-Wantrup's "Economics of Joint Costs in Agriculture," *Journal of Farm Economics*, November 1951, p. 771-818.

time by subscripts, this can be expressed as a joint relationship through time:

$$Q_1 = f(A_1, A_2, \ldots A_n : B_1, B_2, \ldots B_n : \ldots K_1, K_2 K_n : Q_2, Q_3 \ldots Q_n)$$

$$Q_2 = f(\quad " \quad " \quad " \quad " \quad Q_1 \; Q_3 \quad Q_n)$$

$$Q_n = f(\quad " \quad " \quad " \quad " \quad Q_1 \; Q_2 \quad Q_{n-1})$$

Once determined, this set of physical relationships can become the basis for a system of inter-related cost functions. By applying estimated factor cost rates to the various quantities of inputs, total costs for the entire production period can be derived. Since timing as well as quantity of inputs is important, each of the input costs must be discounted to a corresponding present net worth.

But total cost can also be expressed as a function of the outputs of the different intervals. That is, total cost (TC) might be written as

$$TC = f(Q_1, Q_2, \ldots\ldots\ldots, Q_n)$$

And, since the partial derivative of this function with respect to the output for each interval will give the marginal cost (MC) function for the interval output, marginal cost of the various intervals can be written as:

$$MC_{Q_1} = \frac{\partial TC}{\partial Q1}$$

$$MC_{Q_2} = \frac{\partial TC}{\partial Q_2} \text{ etc}$$

Thus the entire set of marginal cost functions will consist of equations in terms of output with as many unknown outputs as there are intervals.

Since present net worth of the forest will be maximized when the discounted marginal cost of each interval is equal to the discounted marginal revenue, a set of revenue functions must also be established. The total revenue functions for an individual forest will relate output quantity and product price but, under the assumed purely competitive conditions, marginal revenue will also necessarily equal product price. In this instance, then, the set of marginal revenue functions can be replaced with a set of anticipated product prices. Now, by equating each of the marginal cost equations to the appropriate expected price (properly discounted), a system of equations with as many unknown outputs as there are equations will result. Simultaneous solution of the system will yield the interval outputs satisfying the stated conditions. This pattern of output will be the growth goal for the forest, for if all expectations are realized, this output pattern leads to attainment of the ultimate objective, profit maximization.

It is apparent that the planned output pattern is heavily dependent upon both the product and factor price anticipations held by the planning agent. Whether these expectations are single valued or not is a subject beyond the scope of this paper: the point is raised only because of its obvious importance in economic planning of almost any sort.

To summarize the steps of the model: (a) The set of inter-related production functions is determined. (b) From these, a set of marginal cost equations in terms of interval output is derived. This is, of course, also the set of supply functions for the individual forest firm. (c) A set of marginal revenue functions is derived.

Under the assumed conditions, these reduce to a set of anticipated product prices. (d) Finally, these cost and revenue functions are combined, then solved simultaneously for the set of interval outputs maximizing present net worth of the forest.

VI

The model for national growth goals, in broad outline at least, is quite similar to the one just presented. In the single firm case, however, the marginal cost curve could be taken as the firm's short-run supply curve. Within an industry-context both product and factor prices may vary as industry output changes even though the assumption of pure competition is maintained. Obviously, some method of logically deriving a set of industry supply functions is required.

The usual theoretical formulation of competitive industry short-run supply curves involves an aggregation of individual firm's marginal cost curves. This poses obvious disavantages from an empirical standpoint. Moreover, it implies that supply curves of individual firms are independent—an assumption that is hardly realistic, as has been observed by Viner,[9] Morgenstern,[10] and others. To avoid these difficulties it is proposed that a "scale model" forest be constructed. From national survey data on stand densities, age class distributions, and the like, a hypothetical forest would be established representing the nation's forests. In the scale model the distribution of size classes, ages, stand densities, etc., would be identically proportional to that found in the nation.

With the scale model forest as a base the physical relationships could be worked out just as in the previous model. But once the set of production functions had been derived for the scale model it would be expanded so that the physical relationships were in terms of the entire nation. That is, the "scale model" production function would be expanded so that all input-output and output-output relationships would be based on the entire stumpage producing area of the nation.

Now, by applying estimated factor cost rates to the various quantities of inputs, total production costs over the entire time period can be determined (as in the previous model) then expressed as a function of interval outputs. And because the input costs are those pertinent to the industry (instead of to an individual firm), provision has been made for those changes in factor prices induced by industry-wide changes in input quantities.

It might be argued that in order to take advantage of this approach one would necessarily know the price flexibility of each productive factor employed in stumpage production. While theoretically valid, this objection may not be very important empirically for one can expect factor prices to be quite flexible over time, particularly when the factors are used in industries other than stumpage production.

The "industry total cost function" provides the basis for derivation of an industry supply function. It may be desirable, however, to insert an additional step at this point because standing timber values, like the value of almost any crop, varies with its accessibility; the more costly it is to move timber to its place of manufacture the lower the price received by the grower. Whether this lowered price is treated on the demand or on the supply side is a matter of preference. It will frequently be advantageous to handle it on the supply side, however, since

[9] Jacob Viner, "Cost Curves and Supply Curves," *Zeitschrift fur Nationalokonomie*, III, 1932, pp. 23-46. Reprinted in *Readings in Economic Analysis*, Vol. 2, edited by Richard V. Clemence (Cambridge: Additon-Wesley Press, 1950), pp. 8-35.

[10] Oskar Morgenstern, "Demand Theory Reconsidered," *Quarterly Journal of Economics*, February 1948, pp. 165-201.

transportation cost will usually be constant on a unit basis.[11] This "cost of inaccessibility" could be incorporated into the industry supply function by first classifying stumpage producing areas on the basis of inaccessibility, next determining the associated costs of inaccessibility, then expressing these costs as functions of output. When so expressed, costs of inaccessibility will usually (though not necessarily) be linear functions. After weighting by the percentage of total production each inaccessibility class is expected to contribute, these functions may be added to the total cost equation derived from the expanded scale model.

The set of industry supply curves can now be derived by the same process as in the former model. By taking partial derivatives of the total cost function with respect to each of the interval outputs a series of marginal cost functions will be obtained each one of which will depict the marginal cost of producing stumpage for a particular interval. And again, these functions will be in terms of interval outputs, with as many equations as there are unknown outputs. This is the set of inter-related industry supply curves.

These functions differ from those of classical theory in two important respects: there has been at least partial recognition that individual firms are not independent in costs, and costs of inaccessibility have been included. The effect of the first will depend upon the price flexibility of the various input factors; normally one would expect the supply curve to be shifted upward. The effect of inaccessibility costs (if they are linear) is simply to shift the supply curve directly upward; its shape would not be altered.

The next step requires a determination of demand functions for stumpage. The situation here is entirely different from that of the individual model, for the quantity produced is a major determinant of stumpage price. It is granted that the derivation of demand functions is no simple task, yet the difficulties to be overcome in forest product demand studies appear no more formidable than those faced in other fields. In any event there is little point in dwelling on demand aspects here—the subject has been well developed elsewhere. The demand equations, however derived, serve only one function in the model, and that is to provide a basis for making stumpage price expectations explicit. As an example only, it might be assumed that the demand functions (one for each period) would have price and quantity as endogenous variables, the exogenous variables being national income, population, competing products, etc. If estimates of the probable values of these exogenous variables were inserted, the resulting set of equations would have only product prices and quantities as unknowns.

The growth goal is that pattern of output through time which will maximize the present net worth of the nation's forest land. Under the assumed competitive conditions the output pattern that will maximize present net worth of the nations forest land will be that one wherein all firms are producing such quantities that their individual marginal costs are equal to price. This condition will hold only when the anticipated demand and supply schedules for the industry are equated.

Each supply function would include the output of several intervals and each demand function would include at least one interval output and its price. If there were (for example) five intervals in the planning period, there would be five supply functions with five inter-related interval outputs and five demand func-

[11] There will be important differences by log size, of course. This does not invalidate the phrase "constant on a unit basis" as used in the text, however, since the effect of log size has already been included in the total cost function.

tions with five interval outputs and the associated stumpage prices. Substitution of the five marginal cost (supply) functions for the corresponding price variables in the set of demand equations would yield five equations in five unknowns, the unknowns being the five interval outputs. Simultaneous solution of this equation system would give the values for the interval outputs making marginal production costs equal to price in all five intervals. This pattern of output would be the one maximizing present net worth of the nation's forest land—the national growth goal.

VII

Because the profit motive may seem of questionable applicability to public agency use some discussion of this point seems warranted. Goals for public agencies are usually couched in terms of "promoting the national welfare," or (in conservation circles) toward securing "the greatest good for the greatest number in the long run." Yet because of the competitive structure of the stumpage-producing industry, a profit-oriented goal is believed highly suitable.

Kenneth Arrow has stated: "In a capitalistic democracy there are essentially two methods by which social choices can be made: voting, typically used to make 'political' decisions; and the market mechanism, typically used to make 'economic' decisions."[12] The decision in question being an "economic" one, it would seem the market mechanism should determine what constitutes an adequate" supply. Taking the market as the guide to output, we should plan to produce just that amount which consumers will be willing to purchase for it is by their purchase of wood products that consumers indicate their choice of quantity. Since the amount purchased will be governed by price and price will be governed by the supply on the market, the equilibrium price would seem the logical guide to production.

This is identical with the mechanism built into the model. Aside from the forest land owned by public agencies, no one stumpage producer controls enough of the output to influence price. If public agencies were to conduct their operations according to a marginal cost-pricing mechanism, the industry as a whole would almost of necessity operate as a perfectly competitive one.

Under these conditions certain results automatically follow. Given the factor costs prevailing at the point of increment, the marginal cost reflects the rise of aggregate costs due to the additional use of real resources at the prevailing prices. Within the stumpage producing industry and under the given factor costs, allocation of resources would be ideal from the standpoint of consumer satisfaction when all firms within the industry are producing so that marginal cost equals product price. This resource allocation within the industry is believed to be a significant contribution.

The largest population segment interested in wood products is undoubtedly that made up of consumers. Through the marginal cost pricing mechanism these consumers may be given a major voice in forest output decisions. The principal drawback, it would seem, arises because the choice indicated in the market represents only the choice of consumers in a particular time period. The time-jointness model requires not only that future consumers' choices be anticipated but also that their individual wants be weighted in some fashion per-

[12] Kenneth Arrow, *Social Choice and Individual Values*, Monograph No. 12 of the Cowles Commission for Research in Economics (New York: John Wiley and Sons, 1951), 99 pp.

mitting comparison with the wants of present consumers. Inter-generation comparisons are on at least as poor a logical foundation as inter-personal comparisons, yet in forestry such comparisons must be made. On this score the most that can be said for the proposed models is that the terms of the comparison are made explicit.

Placing growth goal formulation in a production context forces the integration of both physical and economic factors of forest production. The time-jointness models present a means for analyzing the effect of institutional factors and of policy decisions on forest production. It offers, therefore, a way of not only developing growth goals but also of testing the realism of any output pattern, however determined. In this latter possibility may lie the greatest potential of the time-jointness method.

An Appraisal of the Economics of Scale in the Motor Carrier Industry

By EDWARD W. SMYKAY*

RECENTLY attention has again been focused on a reassessment of national transportation policy. The original document which opened this period was the so-called Week's *Report*[1] of 1955. Hearings on this subject in Washington have been held by the various committees of the Congress. One of the more interesting of these was the hearing on the Adams-Hendry[2] report on the trucking industry held before the Senate Select Committee on Small Business. The public policy standard of this report is clearly and unequivocally stated in the following terms:

"The problem under study here is of interest, because these authors hold that the trucking industry epitomizes the classical model of perfect competition. Here is an industry where there appears to be no substantial economies of scale, where the number of firms is large, and where, in the absence of restriction, entry would be brisk. In short, here is an industry where competition is structurally feasible and technologically possible. Perhaps the gradual erosion of competition by mergers is acceptable in industries where there is persuasive evidence that regulated monopoly can better serve the public interest. However, where, as here, such evidence is almost wholly absent, acquiescence in a relentless process of industrial concentration is without the necessary conceptual underpinnings. If giantism and oligopoly come to the trucking industry, this will not be the result of natural economic forces but of a benign tolerance, if not active promotion, by the Interstate Commerce Commission."[3]

Apart from some errors and questionable procedures contained in this report, the most interesting and substantive portions deal with the expressed philosophy of the authors vis-a-vis the trucking industry and the data supporting this view.[4]

The public policy conclusions which obviously follow this characterization of the economics of the trucking industry is one of complete deregulation. Dependence on anti-trust legislation and the courts and the licensing standards of the several states would then appear to be the sole permissible regulatory devices. Although the weaknesses of the statistical tables above described may justify the summary rejection of the policy conclusions resulting from their use, the analysis contained in the two basic research reports cited in the study must be treated with a greater degree of respect and authority. These two documents are the so-called Nelson Report[5] and the Roberts Article.[6]

The Nelson Report

The Nelson Report relates annual intercity revenues to cost per vehicle mile, cost per ton mile, average haul, and average load for 102 carriers of general freight domiciled in New England. Statistical correlations of each of these factors pared with size in terms of intercity revenues results in the conclusion

* Department of General Business, Michigan State University.

[1] *Report of the Presidential Advisory Committee on Transportation Policy and Organization* (Washington, D. C., United States Government Printing Office, 1955).

[2] W. Adams and J. B. Hendry, *Trucking Mergers, Consolidation and Small Business; An Analysis of Interstate Commerce Commission Policy*, (Washington, D. C., United States Government Printing Office, 1957).

[3] *Ibid.*, p. 7.

[4] *Ibid.*, p. 23, 24, 35, 37 show percentage concentrations for two periods, but the number of carriers in each period varies with no apparent correction factor (p. 41). Table XIV states that data include class I, II, and III carriers but reference shows this to be for class II and III only.

[5] Robert A. Nelson, *New England Governor's Committee on Public Transportation, Motor Freight Transport for New England; A Report to the New England Governor's Conference*, Report No. 5, October 1956.

[6] Merrill J. Roberts, "Some Aspects of Motor Carrier Costs; Firm Size and Efficiency, and Financial Health," *Land Economics*, August 1956.

that there are no significant economies of scale in the trucking industry. The public policy conclusions stated by Nelson are that regulation should be geared to the admission of "any applicant who is fit, willing and able," "certificates should be phrased in more general terms with respect to points, areas, and commodities," . . . . the commission should be directed "to establish maximum and minimum rates for each carrier rather than for a group of carriers," 'safety regulations should be enforced more vigorously" and states and municipalities should foster, among other things, "terminal construction and operations."[7]

A few comments on the above conclusions seem in order. If it is true that competition is a sufficient guide to increasing efficiency and cost reduction in the trucking industry, as the Nelson Report seems to indicate, it is difficult to understand why it is necessary to go beyond the "fit, willing and able" standard of entry. Certainly, to grant minimum rate powers to the Commission puts the problem of administrative determination of costs back into the hands of the Interstate Commerce Commission. Yet it is precisely the point that the Commission is derelict in taking costs into account which is attacked in public policy as presently construed by the ICC. To say that minimum costs are achievable through competition while allowing minimum rate power to the Commission appears to cast doubt on the efficacy of competition in this field in the first place. Placing the maximum rate power in the hands of the Commission also shows doubt as to the merits of the proposed policy. An inherent fear of monopolistic collusion is here apparent.

Nelson's implied fear of competition expressed through granting of the minimum rate power appears to be well grounded if one appeals to the authority of history. Prior to the passage of the Motor Carrier Act excessive competition was pointed to as a serious limiting factor on the future growth of the industry. From such beginnings collective practices of a voluntary nature appeared in the form of what are presently legalized rate bureaus. The alternatives to such voluntary associations appear to be quasi-governmental regulation, some form of private monopoly, or government ownership.

The public policies advocated by Nelson seem to follow logically if his methodology is not open to question. However, search of the literature on the problem of statistical measurement of costs and prices related to size indicate theoretical deficiencies in his methodology. Authorities in these areas of measurement agree that such studies must place each firm in its relevant market, both in the context of the area it serves and the product it sells.[8]

The implied assumption of Nelson that all carriers domiciled in New England serve a single market area is obviously at variance with the facts. The market area served by a common carrier of general commodities is determined by its certificate. Therefore, it appears that the statistical conclusions of Nelson are of a highly dubious character and his policy statements open to serious question.[9]

[7] *Op. cit.*, p. 24.

[8] For an excellent non-quantitative discussion of these problems, see Arthur R. Burns, "The Organization of Industry and the Theory of Prices," *Journal of Political Economy*, October 1937, pp. 662-680. Also, Joel Dean and R. Warren James, *Long-Run Behavior of Costs in a Chain of Shoe Stores*, (Chicago, Illinois: University of Chicago Press, 1942).

[9] This New England Study appears to be oriented to a determination of the relative competitive position of New England to other regions of the economy. The implication of the public policy of competition advocated by Nelson seems to suggest that New England's competitive position will be enhanced by the anticipated reductions in transport costs that will flow from this policy. However, if rates do decline as a result of policy changes of the sort suggested, such cost reductions will redound to the benefit of all areas and New

(Continued on page 145)

A simple illustration will shed light on the inherent weakness of Nelson's approach to the problem. Assume two trucking companies with the same total revenues of $100,000 and operating ratios of 90 percent. From a minimum rate order promulgated by the Michigan Public Service Commission in 1950, line haul costs of LTL (less than truckload) shipments were found to be $.05423 per ton mile while TL (truckload) costs were $.03274[10] per ton mile.

Now assume that one trucker experiences 90 percent LTL while the other has 90 percent TL. Adjusting these known costs to the assumed operating ratios yields rates of $.060256 per ton mile for LTL and $.036378 per ton mile for TL. The end result for the trucker with 90 percent LTL shipments will be an average ton mile cost of $.05112, while the one with 90 percent TL will experience average ton mile costs of $.03409. This wide difference in ton miles costs of the two operations is not related to size in any direct way but is a reflection of the different operating characteristics of the two firms. Unless the raw data are adjusted to take account of these different characteristics there obviously will be a lack of correlation of size and efficiency as to the measures chosen by Nelson to the extent that proportions of TL and LTL business vary with the firms. The above calculations are summarized below.

TABLE I—A Comparison of Average Ton Mile Costs for Two Firms with Same Total Revenues and Same Operating Ratios but Varying Proportions of TL and LTL Tonnages

	Co. A	*Co. B*
Total Revenues	$ 100,000	$ 100,000
LTL	90,000	10,000
TL	10,000	90,000
Cost per ton mile		
LTL	.05423	.05423
TL	.03274	.03274
Rates (Adjusted for 90% operating ratio)		
LTL	.060256	.060256
TL	.036378	.036378
Ton Miles		
LTL	1,494,231	165,959
TL	275,166	2,474,023
Total	1,769,397	2,639,982
Total Cost		
LTL	81,036	9,000
TL	9,008	81,000
	90,044 (Rounding Error)	90,000
Average Ton Mile Cost	.05112	.03409

The Roberts' Article

Of all the recent studies relating to size and efficiency in the trucking industry, the Roberts' article is by far of greatest professional stature. The statistical conclusions of the Roberts' article seem also to indicate that there are no substantial economies of scale in the trucking industry.[11] The policy conclusions of Roberts, however, are considerably more tempered than those of Adams or Nelson.

The unique feature of the Roberts' article is the development of a utilization factor which appears to be dominant in determining trucking economies. It is suggested by Roberts that action before the Commission for extensions, mergers, or consolidations should be considered in

(Continued from page 144)

England will still be faced with the same relative transport cost differentials. August Losch, Alfred Weber, and more recently, Greenhut have all pointed out quite clearly that increases in transport costs are a powerful factor which bring about decentralization of industry. Reduction in transport costs will only enhance centralization, specialization and agglomeration of industrial capacity. Therefore, if transport costs are reduced generally, the New England economy must be able to compensate for the natural tendency towards specialization by significant reductions in the cost of production. The New England economy can gain an advantage in the transport area only if these costs are differentially reduced compared to other regions.

[10] Other than line haul costs were not distributed against TL and LTL. However, it appears that such a distribution would probably increase the disparity between LTL and TL costs per ton mile. Cf.: State of Michigan Public Service Commission, Lansing, Michigan. Docket D-3476, April 10, 1950, p. 8.

[11] *Op. cit.*, Table XXXI, p. 235, however, shows that average cost per vehicle mile are lowest for large companies (51¢) higher for medium size carriers (56¢) and highest for small carriers (67¢).

the light of increased economies that may result from greater utilization of equipment.[12] Simple increases in the size of truck operations where the possibilities of increased utilization are limited or non-existent will not lead to any substantial increases in efficiency.

A simple model may be constructed to illustrate the Roberts' position. Assuming a fixed tonnage equal to one (1) truck load moving in one direction and another truck load moving in the opposite direction between two specified points in a given time period, it follows that allowing two trucks operated by different companies in this service will yield one-half the utilization of one truck and one company. In more complicated movements more advanced mathematical analysis must be employed to determine the level of capacity needed to serve the given tonnages at the greatest economy. In the simplest case it appears that allowance of free entry and open competition may frustrate management's ability to rationalize its operations by this method.

The Market Absorption Ratio

From the point of view of public policy it is suggested that further substantial analysis is required in order to show whether there is any case for lessening competition within a single agency rather than increasing it. It is possible that analysis of trucking operations in terms of the percentage of the market they actually serve may yield more significant results than have heretofore been achieved. This would be somewhat more complicated than the two studies cited above. However, if the percentage of the market, size of firm and efficiency are related by statistical correlations some light may be shed on the question, what is the most efficient size for a carrier in the market it serves?

[12] *Op. cit.*, p. 236.

If such a relationship can be determined, through analysis of total traffic in the market area and the proportion taken by each carrier, then public policy must be oriented in the direction of allowing size increases where greater absorption is necessary to achieve the highest degree of economy of operation. In some cases where an isolated small homogeneous shipping area is found this may call for the creation of a single small seller of truck service. In other larger areas the necessary size may have to be increased if these economies are to be achieved. The better public policy may then seem to be neither the competitive model of a large number of small trucking operations nor the creation of a huge monopoly. In large market areas, when a sufficient degree of absorption of traffic is reached to achieve the economies alluded to above, certification of new competing carriers may be allowed to achieve lowest overall cost.

The author of the present article has prepared such statistical studies which show higher degrees of correlation of size and efficiency than have been achieved in the Nelson Report. However, these conclusions are open to criticism since artificial conventions had to be employed in order to run the correlations. These tentative results are based on total intra-state traffic for the state of Michigan. Carriers deriving more than 50 percent of their revenues from intra-state operations were assumed to be intra-state carriers for purposes of analysis. The defect of this method is obvious but the tentative conclusions suggest the need for further research.

Service Considerations

Roberts suggests that, in the absence of statistical evidence of economies of scale, one of the standards that may be employed in approval of mergers and consolidations is the service improvement

that may result from such actions. Comparison of average hauls of various specialized carriers suggests this possibility. The auto transport industry is one that is directly and often solely concerned with the movement of finished automobiles to markets. Discussion with traffic managers in the automobile state of Michigan indicate that the service aspects of these specialized carriers are of considerable importance to the industry. Since the number of producing points of automobiles is somewhat limited this suggests that long average hauls may be anticipated. Statistical analysis of 88 common and contract auto transport companies show an average haul of 470 miles.[13]

On the other hand, the petroleum transporters show quite a different pattern. The industry is first divided into two classes, one group consisting of those serving the petroleum-consuming states and the other serving the petroleum-producing states. Eighty-seven carriers in the consuming states show an average haul of 92 miles while 23 carriers in the producing states show an average haul of 184 miles.[14]

These differences in average hauls for the various specialized carriers indicate that service requirements vary by product and area. In the case of the auto transport companies the natural marketing process of the auto manufacturers apparently requires a longer average haul than the average for general commodity carriers.[15] This suggests that a principle of parallelism may be a guide to service. That is, in the case of these specialized carriers manufacturers apparently require a physical distribution system which parallels sales effort.

The petroleum transporters further illustrate this point. In the petroleum-consuming states the major functions of truck operation is to make short haul deliveries from storage depots associated with pipelines and refineries to customers in the adjacent territories. The long haul function is performed by pipe line while, in the present state of technology, the short haul is more economical for truck operation. In the producing states, on the other hand, major use of trucks is to transport crude oil from low producing wells to the terminal or storage point where it is then put into the pipeline system. It is frequently uneconomic to connect these low producers into the pipeline gathering system.

The point here is that, apart from consideration of economies of scale, some trucking operations seem to fall into a pattern dictated by the principle of parallellism above described. This principle may be employed to give guidance to regulatory authorities in cases of mergers and consolidations where service considerations are determining.

Finally, it must be pointed out that shippers, who ostensibly are the group in whose interest these policies are proposed, are far from unanimous in accepting these policies based on resource allocation problems with the purely competitive model as its base. The National Industrial Traffic League has recently reiterated with pride its support of conference rate-making procedures under the Reed-Bulwinkle Act.[16] Hearings before the Congress on bills aimed at implementing the Weeks Report are replete with criticism of the ICC and the transportation companies. However, these groups appear to stop short of any fundamental changes in present institutional arrangements.

[13] *Financial and Operating Statistics of Auto Transportation.* Compiled by the industry from ICC Reports,, 1955.

[14] Trinc's *Blue Book of the Trucking Industry.* Eleventh Yearbook, 1955, Transport Research Inc., Washington, D. C.

[15] C. F. Roberts, Table XXXI, *Land Economics, op. cit.*

[16] *Traffic World,* November 9, 1957, p. 100.

The National Association of Frozen Food Packers is supporting Senate Bill (S-2553) which has as its object the redefinition of the agricultural exemption recently expanded by the Supreme Court of the United States in the Frozen Food Cases. This committee seeks to place under common carriage certain frozen food categories presently being shipped by exempt carriers.[17] The ground of support for this action given by the Committee is that, under exemption, frozen food rates have disrupted the rate structure resulting in disorderly marketing conditions in the industry and that, because of unstable revenues to carriers, adequate supplies of equipment necessary for the safe shipment of frozen products are not forthcoming under present arrangements.

If the position of the Frozen Food Committee is correct in declaring that adequate supplies of equipment are not forthcoming, then it appears that at least for this segment of the trucking industry automatic adjustments of adequate supply of truck service to available demand through competition is not occurring.

Automatic adjustment is viewed as possible in the trucking industry by some writers because of the high rate of depreciation obtaining. However, this depreciated equipment can be purchased by anyone wishing to enter the industry under the free entry concept. With a 20 percent rate of depreciation it will require but two and one-half years for the industry to have approximately 50 percent of its real capital in fully depreciated assets. But the lower depreciation costs on this equipment will enable operators to soon establish a rate structure that will make it difficult to justify new investment in order to maintain the efficiency of plant. It appears that this is the process that may now be occurring in the frozen food segment of the trucking industry.

[17] *Traffic World*, Nov. 9, 1957, p. 36.

Summary and Conclusion

The research into the relationship between size of firm and efficiency in the trucking industry described above is certainly a contribution to the ultimate resolution of a National Transportation Policy. However, it represents only the beginning of the total research effort that is necessary. The criticisms leveled above do not in any way detract from the research already done. It is only intended to show here that, because of certain deficiencies and weaknesses, it is too early to present dogmatic solutions to the problem of public policy for this segment of the transport industry. More fundamental research oriented not only to statistical cost studies based on implicitly assumed conditions of perfect competition must be made but certain types of institutional analysis seem also to be called for. Too much has been made of the cost of production side of this problem. The assumption that shippers are purely cost-oriented must be properly investigated as to its validity. There appear to be some grounds for considering the service requests of shippers for transport not only in terms of the short run but also in the long run. Consideration of the physical distribution requirements of the shipper may also be a profitable subject of investigation. The effect of unstable revenues upon carriers under a competitive free entry proposal must be investigated to determine its effect on long-run investment.

These are only a few of the problems that require investigation and analysis. It is necessary that they be systematically catalogued and their impact measured in order to find that public policy which will yield the greatest total beneficial result for the trucking industry and the public which it serves.

Exclusive Agricultural Zoning: An Appraisal
I—Agricultural Shortages†

By JACK LESSINGER*

THERE is now a rising interest in saving agricultural resources from "urban erosions." Agriculture is not only being increasingly displaced from prime land but tracts are often established as residential islands in the midst of settled farming communities. The resulting "scattered subdivision" patterns appear to be responsible for many new social and economic problems.

One of the central arguments of those who are concerned with agriculture's dislocation from prime land seems to be as follows: Low density urbanization is spreading over our best agricultural land and at an increasing rate. Furthermore, cities ruin land for farming. Thus, a limited supply of land is being rapidly reduced. On the other hand, the same process is increasing the demand for the agricultural products of the land, also at an increasing rate. As a result of these, as well as other land-depleting and demand-increasing factors, land for agriculture may become critically scarce. There are no really new factors which may be relied upon to alter the fixity of land supply. Outside of agricultural conservation and presumably limitation of urban populations there is no way we can escape inevitable problems. Thus, we are irresponsibly optimistic if we depend on technology for salvation. The fall of other civilizations has been associated with the non-conservation of agriculture. This may be our fate too.[1]

The objective of this paper is to test the proposition that potential shortages of food and fibre are *not* likely to be serious enough to warrant immediate limitations on the displacement of prime agricultural land. Such limitations are being proposed in the form of exclusive agricultural zones within which most urban uses are to be denied entry. To the degree that the shortages view predominates, these "greenbelts" would be permanent safeguards on *prime* land to protect future generations. Preservation of *prime* land for agriculture may also be sought on grounds of comparative advantage, conservation of agricultural processing industries, and diseconomies of "scattered" land use patterns. The present paper deals only with the agricultural shortages problem.

In addition to the objectives enumerated so far, exclusive agricultural zoning may be enacted partly to achieve certain local urban benefits. Thus, agriculture may be permanently or temporarily retained in order to consolidate subdivi-

† This study is based on data gathered with the assistance of the Real Estate Research Program, Bureau of Business and Economic Research, University of California, Berkeley, in cooperation with the Farm Economics Research Division, United States Department of Agriculture, The writer takes full responsibility for all opinions and factual material presented. He wishes to thank Sherman J. Maisel and Robert G. Schroeder of the Real Estate Research Program, Melvin M. Webber and Catherine Bauer of the City and Regional Planning Department, University of California, Berkeley, and M. Louis Upchurch, Farm Economics Research Division, United States Department of Agriculture, for their suggestions. A second paper on this general subject will discuss "Comparative Advantages," and will appear in the August 1958 issue of this *Journal*.

* University of California.

[1] Fragments of the argument presented can be discerned in the following: Donald A. Williams, "Soil and Water for the Future," *Soil Conservation*, December 1955, pp. 115-116; Erling D. Solberg, *Rural Zoning in the United States*, United States Department of Agriculture, Agricultural Information Bulletin No. 59, 1952, p. 53; George Alcorn and R. H. Sciaroni, *Agricultural Zoning Makes Sense*, University of California, Agricultural Extension Service, San Mateo County, 1954, unpaged; News release issued through facilities of United States Department of Agriculture, Washington, D. C., October 9, 1956; and Howard F. Gregor, "Urban Pressures on California Land: A Rejoinder," this *journal*, February 1958, pp. 85-6. A mimeographed compilation of quotations on the seriousness of potential shortages is available from the author.

sions, preserve industrial sites, maintain green belts for amenity values, prevent crowding and reduce rates of growth.[2] But these benefits may be attained *even if agriculture is not necessarily located on the best agricultural land.* For example, local planners may desire to provide country atmosphere and scenery but urbanites may be even more thrilled to see steers grazing on poor pasture land than to watch tractor-driving on prime agricultural land. Much confusion arises from the current tendency not to discriminate between the two kinds of objectives, those requiring and those not requiring agriculture to have first choice of the best land. The second class of objective is beyond our present scope.

The Meaning of "Agricultural Shortages"

Agricultural shortages *serious enough to justify a policy of exclusive agricultural zoning* would be indicated by a critical relationship between the long-run value of rural-urban land in agriculture and its long-run value in urbanization within a foreseeable time period. Agricultural value of farm real estate is a function of imputed income to land from agricultural operations, plus a capital value for intangibles. In an area of rural-urban transition, urban value for the same piece of farm real estate depends on incomes anticipated from urban uses.

If food and fibre become relatively scarce, agricultural land values increase until some new point of equilibrium is reached. The economy places increasing importance on the use of land for agriculture. As agricultural land values increase relative to urban values, the economy signifies its preference to have more of its land in agriculture even at the expense of urbanization.

The relative prices which represent "shortage" would depend on prevailing social values. For present purposes, a level of agricultural land values on a par with urban land values in the rural-urban transition areas seems to be a reasonable definition of "agricultural shortage." This would place the definition squarely on the basis of economic preferences. It would mean shortages serious enough to stop further transfers of land to urbanization.[3] If urban values in the rural-urban fringe were higher than agricultural values, urbanization would be valued more by society. We assume that there are no military or other extra-market reasons for a policy of cheap food; that is, there is no reason to define "shortages" in terms of agricultural land values *lower* than urban in the rural-urban areas.

It may be asked, "Why bother to define shortages if they are to be prevented by the automatic action of the competitive market?" But we do not rely on any such automatic action. If *future* shortages can be foreseen, cities can *now* be prevented from permanently ruining prime agricultural land. Thus the analysis allows for the possibility of wrong decisions of present buyers and sellers of land. For future incomes are necessarily gauged imperfectly on the basis of past experiences; certain temporary forces may be given too much weight. There are also other market frictions and defects.

We use market prices here to represent long-run values. But there is no reason to expect a net bias in favor of our hypothesis. It is possible that as a result of declining net farm incomes and increasing farm land prices, current agricultural land prices are too high. Also, due to urban scatter urban prices may be too low. With a consolidated type of de-

[2] Some counties such as Los Angeles and Santa Clara in California have enacted ordinances with both purposes in view. Many others are contemplating such action.

[3] This is only an approximate condition. Various costs of transfer and intangibles are also involved.

velopment in the fringes, urban prices may be higher. Thus use of market prices may actually lean over backwards against the hypothesis of this paper, namely, that public limitations on the displacement of prime agricultural land are not required at this time.

We consider shortages in three time periods, shortages at present, by 1975, and after 1975. For each period the objective is to compare agricultural and urban long-run values of land in rural-urban transition areas. However, available data are incomplete for this task. Therefore, it is necessary to present parts of the total picture and to use reasoning to suggest how gaps might be filled in. For example, much is known about land requirements and supplies at present and by 1957. While this does not explicitly lead to value comparisons, certain general relationships are inferred. Direct evidence on rural-urban land value ratios is less available. For this reason, where possible, resource requirements and supplies are compared first, followed by available approximations of rural-urban value ratios. One supports the other. A case study carried out by the author in the Santa Clara Valley of California is the basis of limited inferences on present rural-urban value ratios, as viewed against the context of present resource requirements and supplies in the economy as a whole. Shortages by 1975 are considered in terms of relative changes of present rural-urban price ratios in the context of resource requirements and supplies by 1975. Only very general observations are possible with respect to the period beyond 1975.

Shortages at Present

About 470,000 tillable and untillable acres have annually gone over to urbanization proper in the United States since the end of World War II.[4] This includes transfers to roads, airports, public, commercial, industrial, and residential uses. On the assumption that reservoirs generally use poorer grades of land relatively distant from urban centers they are omitted from the acreage converted.

The approximately 470,000 acres which in recent years have annually gone into urban uses represent about 0.1 percent of the total cropland now available for crops. According to the 1950 Census of Agriculture, total cropland used for crops or idle in the United States amounted to 409 million acres. Together with 69 million acres of cropland used for pasture there were 478 million acres of cropland available for crops. It should be recognized, however, that in some areas the amount of cropland which goes over to urbanization has more importance than is indicated by its proportion of total cropland. For example, in California there is a tendency for urbanization to take better qualities of land.

The annual acreage leaving agriculture for urbanization seems small in view of large cropland reserves. Wooten and Anderson indicate that total cropland in the United States can be increased over 1950 by 35 percent.[5] If certain physical limitations can be overcome, the possible increase may be in the neighborhood of 45 percent. This is in addition to such upgrading as irrigation, better drainage, and better use of pastures. Furthermore, the potential 35 percent increase in cropland includes only Soil Conservation Service Land Classes I-III. If Class IV

[4] Hugh H. Wooten and James R. Anderson, *Major Uses of Land in the United States, Summary for 1954,* United States Department of Agriculture, Agriculture Information Bulletin No. 168, 1957, p. 26.

[5] High H. Wooten and James R. Anderson, *Agricultural Land Resources in the United States,* United States Department of Agriculture, Agriculture Information Bulletin No. 140, pp 1955,. 34-40.

were included also, a larger percentage would be available.

The relatively minor scale of urban encroachment on the present food supply is further suggested by comparing intensive and extensive movements of land out of agricultural uses. About twice the acreage going from agriculture to urbanization is going out of agriculture into more extensive uses. The latter are comprised of more than 500,000 acres of cropland and permanent pasture reverting to woodland and 400,000 acres subject to soil erosion and soil blowing.[6] Since these acres are just marginal for agriculture, presumably a relatively small increase in the value of agricultural land could make it feasible to salvage them. For example, with higher product prices special conservation practices may be found economical. In other words, for every acre going into urban use there are about two acres which probably could be brought back into agriculture at a relatively low cost if there were any economic need to do so. Assuming for the moment adaptability to grow the needed crops, these marginal acres might substitute substantially for the production lost on urbanized lands. The question of adaptability is considered later.

California as a Special Problem Area

There has been special concern about the supply of agricultural land in California. The 1957 population of over 14,000,000 is widely expected to double before the end of the century. Some believe this additional population capable of taking away not only all the good agricultural land, but all the cultivable land, both good and bad.[7] Much of the apprehension over this issue is based on two fallacies. The first fallacy concerns incorrect criteria for determining land requirements per urban population unit. Professor Gregor has cited Dr. Solberg's estimate of 1.4 acres as the requirement per family of 3.3 persons. This is equivalent to 1509 persons per square mile.[8] But this figure includes land in farmsteads! Other sources frequently include military reservations, national parks, wild-life areas and others only remotely concerned with the kind of land for which some public protection is sought. Furthermore, compilations of land use changes often lump together as urban much agricultural land close by and between subdivided land.

The new urban population is assumed to be willing and able to deposit itself at a low density over the agricultural areas of the state like snow on a plain. Nothing could be further from the truth. Densities of urban population generally increase, the closer their locations to mature urban centers. Uusually too, this increase in density is more than proportionate to the decrease in distance. Overwhelming economic and social linkages are responsible. Thus, only 11 percent of the new California population is currently attracted to the Sacramento and San Joaquin Valleys, the most important agricultural areas of the state. Over 70 percent is drawn to the two primary metropolitan areas, Los Angeles and San Francisco.[9]

The importance of high density clustering in California, as elsewhere, is further demonstrated by distance-density relationships within the two primary metropolitan areas. Not only is the bulk of population in those two areas located a short distance from their respective centers, but densities are high and increasing; and the lower the density the more the

[6] *Ibid.*
[7] Gregor, *op. cit.*, p. 84.
[8] *Ibid.* The text is not clear that 1.4 acres applies to the family unit, but this seems to be implied.
[9] Carl M. Frisen, *Population of California's Areas and Counties in 1957*, Department of Finance Budget Division, Financial Research Section, Sacramento, 1957, p. 1.

increase. There is a remarkable similarity between the two areas in terms of the three distance zones. These facts may be observed in Table I.[10] In the first place, in both 1940 and 1950, *over 70 percent* of the total Los Angeles and San Francisco metropolitan population resided within a radius of *14 miles from the respective centers*. It is true however, that this percentage has decreased

TABLE I—URBAN DENSITIES IN THREE DISTANCE ZONES, LOS ANGELES AND SAN FRANCISCO METROPOLITAN AREAS: 1940 AND 1950

Distance Zones (Miles)	San Francisco 1950 Density Thousands Per sq. mile	San Francisco 1950 Percent of Total Population	San Francisco 1940 Density Thousands Per sq. mile	San Francisco 1940 Percent of Total Population	Percent Inc. in Density
0-7	22.25	35.6	21.07	44.4	6
7-14	5.16	37.3	3.79	36.5	36
14 and over	.75	27.1	.44	19.2	70
0-14	13.50	72.9	13.27	80.9	2
Total	10.0	100	10.8	100.1	..

Distance Zones (Miles)	Los Angeles 1950 Density Thousands Per sq. mile	Los Angeles 1950 Percent of Total Population	Los Angeles 1940 Density Thousands Per sq. mile	Los Angeles 1940 Percent of Total Population	Percent Inc. in Density
0-7	10.82	32.6	10.32	44.8	5
7-14	4.52	40.0	2.88	33.4	57
14 and over	.87	27.5	.34	21.8	156
0-14	7.35	72.6	7.14	78.2	3
Total	5.6	100.1	5.6	100.0	0

over the 1940-1950 period. Second, within the 14-mile radius population densities were four to eight times greater than the estimate of 1509 persons per square mile. Third, population densities were increasing in each of the three distance zones. Fourth, the percentage increase in densities was the greater the lower the density at the beginning of the period. In the second zone, seven to 14 miles from the center of San Francisco, where densities had been more than twice the estimate of 1509 persons per square mile in 1940, there was a 36-percent increase in density by 1950. The increase in the density of the Los Angeles second zone was even greater. In the third zone, where densities were lower than 1509 persons per square mile,

[10] Table I is a rearrangement of Tables XVII-2 and XVII-3 in Warren S. Thompson, *Growth and Changes in California Population*, Los Angeles, California: The Haynes Foundation, 1955, p. 263.

increases in densities over the 1940-50 period were from 70 to 156 percent.

Over-all densities, neglecting distance zones, did not change during 1940-50 in the Los Angeles area and even decreased in the northern metropolitan area. But, in the light of the relationships of Table I, these density changes are deceptive, arising primarily from the greater importance of the third zone during the decade. The point is that, while the densities in the third zone were low, they increased at a high rate. A continuation of this tendency would be in accord with the logic of urban linkages. Undoubtedly, present increases in density in the third zone are obtained via the filling of space with low density uses. However, as the zone becomes higher in the hierarchy of linkages, its typically large percentage of remaining empty spaces become filled with more intensive land uses. In addition, older structures may be converted or torn down to make way for more intensive uses.

A second fallacy in the apprehension over increases in California's population lies in giving little credit to alternatives which might displace part of present agriculture. Professors Gillies and Mittelbach recently called attention to this point.[11] If indeed the population of California grows to 28,000,000 or even 40,000,000, why must such a colossus of industry produce all of its own food? A highly industrialized area with increased productive efficiency as a result of rising technology and larger scale may well afford to import some of its agricultural requirements. If these arguments are correct it is reasonable to consider California's agricultural shortage problem from the point of view of the nation as a whole. If no shortage problem exists in the nation, none exists in California.

[11] James Gillies and Frank Mittelbach, "Urban Pressures on California Land: A Comment," this *Journal*, February 1958, p. 82.

Case Study. So far, the status of shortages has been inferred from relationships between physical quantities of urban and agricultural resources. We now ask more explicitly to what extent does society value the products of agriculture in rural-urban areas of transition compared to urban products? Are these agricultural products valued so high that agricultural values of land are as high or higher than urban values? If not, what are the relative magnitudes of such values?

Relevant findings of a study in the north Santa Clara Valley, California, are briefly summarized here. The description of the research area makes it evident that the results are suggestive of a wider range of application. This is due to the above-average intensity of agriculture in the area.

The north Santa Clara Valley of Santa Clara County is an integral part of the San Francisco-Oakland Bay Area. Located in the approximate center of the triangular valley, San Jose—the largest city in the county—strategically straddles the principal routes northward to San Francisco and Oakland. These routes form the bases for the principal nuclei of urban expansion.

Agriculture in the valley is represented mainly by such intensive uses as orchards and truck crops. The high degree of specialization resulting from favorable environmental factors is illustrated by the large acreage devoted to prunes, the leading crop. In 1954 this crop alone occupied 41,160 acres, or about 41 percent of the entire county area in fruits, nuts, and vegetables.[12] Since the end of World War II a relatively large amount of agricultural land in the county has been taken up by urbanization.

[12] Department of Agriculture, Santa Clara County, *Annual Crop Reports.*

According to available data, farm real estate prices in the urbanized north of Santa Clara County increased annually, on the average, between 300 and 500 dollars an acre during the first half of 1950. Of course, some localities experienced increases which were lower and some higher than these rates. For a rural-urban belt of maximum urban scatter, prices ranged from a trend value of about $1,000 per acre in 1950 to $3,000 per acre in 1955.

These prices are a composite result of agricultural, intangible and potential urban-use incomes. Analyses on costs and returns in agriculture indicate that up to about 1950 agricultural and intangible incomes predominated in determining farm real estate value for prime land. However, beyond that, increases reflect primarily potential incomes capable of being earned in urban uses. Benchmark net incomes over the period 1945-1954 have been established for five orchard crops under eight different cost conditions each. Rates of return are computed as maximum rates which a new farmer on a premanent farming basis (not conducting pre-urbanization salvage operations) could reasonably anticipate, based on the price and costs experience 1945-1954. "Maximum" rates rather than average rates are determined by using costs on the "low" side and incomes on the "high" side, rather than averages. Thus the rates computed are biased against the hypothesis of this paper. With respect to opportunity net returns to farm real estate, a six-percent level is tentatively used based on the following reasoning: (a) six percent can be obtained by local operators in low risk investments, e.g., mortgages; (b) farm real estate appraisers familiar with this type of agriculture indicate land earnings even higher than six percent;[18] and (c) the maximum net incomes to farm real estate computed here result in rates of return in excess of six percent when divided by values of comparable productive land in strictly agricultural areas.

Preliminary data indicate that more than 65 percent of the total orchard acreage in the urbanized north of Santa Clara County, much of it prime land, was uneconomic for agriculture in the early 1950's inasmuch as it could not return six percent on estimated long-run urban values. This at least is the conclusion derived from the study of net land incomes and urban land prices based on specific methods and assumptions. An even larger percentage of cropland (including non-orchard uses) was in this position at that time. The uneconomic orchard acreage alone is a physical amount in excess of all north valley urbanized acreage up to 1955. However, these conclusions are qualified as follows: (1) The influence of intangibles, capital gains taxes, and real estate commissions are not considered. A reasonable assumption on these factors may postpone uneconomical status by one or two years. (2) Relatively high "subdivision prices" used to determine submarginality may not apply to all orchard land in the north valley. (3) Certain small acreages are highly profitable and could feasibly compete temporarily with urbanization at present. (4) No account is taken of possible adjustments within agriculture.

The rural-urban relationship, as above, is significant only if the 1950-55 prices paid by urban users are accepted as

[18] Ford G. Shaffer, "Market Trends in Rural Real Estate," *Bay Area Real Estate Report, Second Quarter, 1955,* (San Francisco: Bay Area Real Estate Research Committee), p. 66. (Indicates 6-12 percent net return); letter Jan. 30, 1955 from Norman Graham, Assistant Manager, Loan Department, Travelers Insurance Company, ("On a landlord basis, seven percent of the current market is near the minimum when good first deeds are available at five percent.")

representative of long-run minimum urban values. By 1958 urban land prices already far exceed prices of the 1950-55 period. One may, however, question whether land values will persist at their high urban level in view of the relatively large physical supplies of land which are available for urbanization in the area, especially in the case of a prolonged recession. On the other hand, agricultural land values may also decline in such an eventuality.

Potential Shortages by 1975

There is no question but that by 1975 very heavy demands will be made upon American agriculture. According to a recent study: "Total requirements for farm products for domestic use and export under conditions of full employment are projected for 1957 to a level around 40 to 45 percent above 1953."[14] Most of this increased demand results from forecasted population increases. Some is attributable to rising consumer incomes under conditions of full employment.

In supplying these new demands technology is a key factor. This consists of two parts, (a) the backlog of known but unused technology, and (b) new insights and findings. Within a period of 10-15 years only the impact of the backlog on yields can be predicted within broad limits, thus providing a short-run resource.[15]

If all the economically feasible backlog now available were applied, increases in demand for food and fibre by 1957 may apparently be met by American agriculture with almost negligible increases in cropland. Carl P. Heisig of the United States Department of Agriculture anticipates the following changes in major crops by 1975 if all the economically feasible backlog are utilized: (1) Harvested acreage of corn—about 4 million acres less than in 1956. (2) Other feed grains—also several million acres less. (3) Soybeans—about 3 million acres less than the large acreage of 1956. (4) Wheat and cotton—acreage about where it is today under the allotment programs. (5) Hay—acreage up about 13 million acres.[16]

Wooten and Anderson estimate no more than 35 million acres will need to be converted to cropland from present grassland and woodland by 1975.[17] This is not at all the same as implying that 35 million represent a limit. If they are correct only one-fifth of total potential cropland, Soil Conservation Service Land Classes I to III, would be needed.

Adaptability of Needed Cropland. If any additional cropland is required at all, it must be adaptable to grow the particular kinds of needed products. Is urbanization tending to remove certain kinds of land not adequately represented in the cropland reserve? The following reasoning indicates that this is unlikely.

There are six crops which account for around 90 percent of the harvested cropland.[18] These are harvested corn, other feed grains, soybeans, wheat, cotton, and hay, as mentioned by Heisig above. But of these six, as already indicated, assuming full utilization of the economically feasible technological backlog, the only crop which would tend to be expanded would be hay. Hay is readily grown on a wide variety of soils. Therefore, it seems possible to conclude that

[14] Rex F. Daly, "The Long-Run Demand for Farm Products," *Agricultural Economics Research*, July 1956, p. 73.

[15] Byron T. Shaw, "The Role of Research in Meeting Future Agricultural Requirements," *Agronomy Journal*, March 1953.

[16] Carl P. Heisig, speech delivered at the 34th Annual Agricultural Outlook Conference, Washington, November 26, 1956, p. 2 of published paper.

[17] Hugh H. Wooten and James R. Anderson, *Agricultural Land Resources in the United States*, U. S. Department of Agriculture, Agriculture Information Bulletin No. 140, 1955, p. 40.

[18] Carl P. Heisig, *op. cit.*, p. 2.

there is no problem in land adaptability to new production needs so far as at least 90 percent of American agriculture is concerned. What about the remaining ten percent?

Intensive crops, fruits and vegetables, constitute the primary remaining problem in adaptability. Between 1955 and 1975 truck crops are expected to increase in production by 40 percent, fruits and nuts by 35 percent.[19] In terms of the analysis by Barton and Rogers, an annual increase of .81 index points in production would be required in vegetables over the period 1951-53 to 1975.[20] This increase is modest compared to increases already achieved over several other historical periods. For example, during World War II there was an annual increase of 2.33 index points and over a long period from 1910-12 to 1951-53 there was an annual increase of .93 index points.

Fruits and nuts may be a somewhat more serious problem, though it would be hard to believe that additional suitable land could not be found for crops which in 1954 occupied less than .7 percent of available cropland.[21] In terms of the analysis by Barton and Rogers, an annual index point increase of 1.76 is projected as required production from 1951-53 to 1975. The highest increases in production achieved historically, however, was 1.65 annual index points in the period between World Wars I and II. Over the period 1910-12 to 1951-53 annual increases were only 1.01 index points.[22]

On the other hand, historical increases in production have been achieved in spite of decreases in acreage. Precise comparisons cannot be made due to lack of comparable data. Furthermore, there are complexities in the study of fruit and nut yields arising from changing age distributions. The following comparisons are only suggestive. In 1954, eight major deciduous fruits constituted about two-thirds of all acreage in fruits and nuts.[23] It is estimated that between 1919 and 1954 this category decreased in acreage by about one-third.[24] The one other category which now occupies a large part of the remainder of the total acreage in fruits and nuts is citrus fruits. Between 1939 and 1954 these increased in acreage by less than ten percent.[25] By and large it may be concluded that increases in production of most individual fruits and nuts were obtained with a generally decreasing acreage. It should be cautioned, however, that an undetermined part of the increase in productivity resulted from favorable changes in age distribution of trees.

Reductions in orchard acreages seem diffused over wide agricultural areas as well as in areas of urban growth. This is another reason for confidence that adaptable land reserves for fruit production are available in spite of urban encroachments. That is, marginal fruit land can be brought back into production if necessary. In California, total fruit and nut acreage, including citrus fruits, has declined over 23 percent between

[19] Barton and Rogers, *op. cit.*, p. 23.

[20] These index points provide a measure of absolute change. 1947-49 is the base or 100-percent period.

[21] Twenty-one fruits and planted nuts occupied 3,165,800 acres (this is almost the total acreage in fruits and nuts.) United States Department of Agriculture, *Agricultural Statistics, 1955*, pp. 142-43.

[22] *Ibid.*, p. 25.

[23] *Ibid.*, pp. 142-43. Commercial apples, peaches, pears, grapes, cherries, plums, prunes, and apricots. In 1954 these eight occupied 998,400 acres.

[24] Commercial apples in 1919 estimated as 50 percent of all apples. This compares with 57.5 in 1934, 61.5 in 1942, and 63.6 in 1951. United States Department of Agriculture, *Agriculture Statistics, 1952*, p. 185. The estimated decrease was from 3,017,700 acres in 1919 to 1,998,400 in 1954.

[25] Acreage in citrus fruits includes oranges, tangerines, grapefruits, lemons, and limes. These increased from 756,800 in 1939 to 824,000 acres in 1954. United States Department of Agriculture, *Agricultural Statistics, 1955*, pp. 142-43.

1927 and 1953.[26] There is evidence that some orchard acreages, such as prunes and apricots, decline at an even faster rate in the purely agricultural districts than in areas of urban scatter.

Experience in the Santa Clara Valley indicates that there are limited acreages which now have capabilities to compete with urbanization. To some degree this capability depends on advantageous ages of trees, a situation which may not persist due to declining new plantings. However, further research may indicate a certain few crops which in the future will be able to out-compete urbanization for land no longer available. These are special crops with limited adaptation. Such findings may be a basis for reserving "required" land now. Economic criteria for such reservations may follow familiar principles but remain to be worked out in detail.

Long-term agricultural-urban land value ratios should not increase significantly by 1975—even under conditions of maximum pressure on food supplies. But as already indicated, there is a large reserve of land which can be used if prices warrant it. The utilization of these additional lands would further counteract upward tendencies in farm prices. Futhermore, increasing populations and incomes may well force urban values up. Therefore, the large present differentials between agricultural and urban land values suggested herein are not likely to be much reduced by 1975, if at all. They may be increased as a result of increases in urban values.

Potential Shortages After 1975

Agricultural resources and requirements in the period after 1975 are largely beyond our horizon. In broad terms, however, the three most important variables affecting adequacy of supplies are likely to continue to be population increases, increases in per-capita real incomes, and the rate of progress in agricultural technology.

Some analysts are pessimistic about potential improvements in agriculture after our present backlog of technology is used up. For example, Drs. Trelogan and Johnson state:

> "One factor of significance emerges from nearly all the preliminary work done in ARA to date—as production per acre and per animal pushes upward, it is increasingly difficult to sustain the higher level of production."[27]

Dr. B. T. Shaw, whose work is cited by Trelogan and Johnson, writes:

> "Our current position in research is unfavorable. We have not been turning out new findings at a rate equal to the rate at which they are being used."[28]

Professor J. D. Black relies partly on gradual decreases in rates of population growth as a means of escaping eventual food shortages. However, he too does not overlook the possibility of a gradual increase in agricultural prices relative to urban.

> ". . . . It seems most rational to expect that rates of population increase in our own country will slacken gradually, but not, except for some new development, get back to the levels of the depression 1930's. The arts of agricultural production and development of our land resources will, however, be able to advance fast enough to permit a steady rise in the level of food consumption in the country, and also of clothing as far as the cotton part of it is concerned. This does not mean that over the longer pull the prices of farm products many not advance more than prices in general, as indeed they have over the

[26] 1,852,120 acres in 1927 to 1,420,822 in 1953. R. E. Blair, *Acreage Estimates—California Fruit and Nut Crops 1919-53 by Counties*, California Crop and Livestock Reporting Service Special Publication No. 257, Supplement, April 1956, p. 3.

[27] Harry C. Trelogan and Neil W. Johnson, "The Evitability of Technological Advance," *Journal of Farm Economics*, November 1953, pp. 604-5.

[28] B. T. Shaw, *op. cit.*, p. 92.

long-run past. If they do, it will be because agricultural land resources are after all somewhat limited, and basic science and its applications may not, as was true in the past century, make as much progress in agriculture as outside of it."[29]

An interesting view for comparison is advanced by Richard L. Meier. He maintains that technological effort is currently being expended on luxury foods which in the long-run cannot possibly satisfy world food needs. On the other hand, technology for producing new and untried but nutritious foods now exists or gives tremendous promise for futher development. All that stands in the way are the rigid customs of man himself.

". . . . recent scientific advances offer means for producing sufficient foodstuffs to care for at least twenty times the present world population . . . the rate at which new foodstuffs can be introduced to satisfy needs will depend much more upon progress in the psychology and sociology of food acceptance than upon advances in technology.[30]

No final judgment can be made as to the wisdom of curtailing present uses of agricultural land to insure against possible agricultural shortages after 1975. However, there are many reasons why such curtailment would not appear to be a rational policy even if it were assumed that rates of improvement in agricultural technology must ultimately fall. Essentially, an uneconomical use of land for at least the next 20 years would be exchanged for an uncertain attempt to accomplish what now seems to be an unnecessary objective, namely, to make food more plentiful for future consumers.

In the first place, Americans of the next century are likely to be substantially better off in non-agricultural goods and services than today. Scientific developments in nuclear energy, automation, and many other fields are just beginning to be applied to industry. This means that, although agriculture may take an increasing share of national income, under the assumption of lagging agricultural technology the consumer of the future is not likely to be an object of public concern. In the second place, foods may become more expensive simply because of economic preferences. If people will want to eat more steak, they will have to pay steak prices. At the other extreme—as indicated by Meier—if psychological and sociological problems in the adoption of new types of food are solved, an abundant food supply would be assured. Third, if expensive tastes are combined with lagging technology then populations may need to be rigidly controlled. Increases in population can always be great enough to wipe out any gains realized by the conservation of resources. Without population controls, if the technological rate of progress in luxury foods declines and if such foods requiring relatively great amounts of resources are increasingly preferred, there is no theoretical limit to the amount of cropland which might be needed. Therefore, if rates of improvement in agricultural technology some day became inadequate, populations will need to make their own choices as to desirable rates of procreation and percent of income to be budgeted for food. One or both of these factors may have to give. At the present time it is by no means certain that agricultural improvements, even of luxury foods, have come to a dead end.

Summary and Conclusions

Agricultural shortage is defined in terms of the ratio between the long-run agricultural and urban value of farm land in rural-urban transition areas. To the extent substitutes are scarce, the

[29] J. D. Black, "Agriculture in the Nation's Economy," *American Economic Review*, March 1956, p. 19.

[30] Richard L. Meier, *Science and Economic Development: New Patterns of Living* (New York: Massachusetts Institute of Technology and John Wiley, 1956), p. 233.

agricultural value of this land rises relative to other values. With population pressures urban values rise also. A ratio may be struck between the long-run value of land for agriculture and for urban uses which from some social point of view will be considered "critical." A reasonable definition of food shortage in these terms is at least parity of the two values. It is approximately true that when agricultural land values are lower than this parity the economy still prefers the urban products of these marginal acres to its agricultural products.

So far as the present agricultural supply is concerned, our condition of "surpluses" is well-known. But even in a case area where agriculture is relatively intensive, such as the north Santa Clara Valley of California, our American economy does not value the agricultural products of land high enough, on the average, to permit agriculture to compete favorably with urbanization.

What of the period up to 1975? There seems to be little danger that the cost of substitutes for urbanized land at the rural-urban margin will approach the urban value of this land in the foreseeable future. To be sure, agricultural product prices may go up; they may even go up relative to other prices. Price increases do not imply dangerous "shortages." Instead, they merely signify allocations of resources in accordance with prevailing economic preferences. On the other hand, if urban values increase relative to agricultural, potential agricultural shortages, as defined, may decline.

Technological improvements and relatively slow population growth have been our salvation up to now. Without these, even our vast land resources might have been inadequate long ago. If technological improvements in luxury foods decline, even drastic exclusive zoning measures from now on may provide but a brief respite from shortage problems. Future populations may sooner or later be faced with choices between desired rates of procreation and desired percentages of income budgeted for food. These would probably not be harsh choices. Rates of improvement in non-agricultural technologies are generally expected to continue. Furthermore, a tremendous output is possible if recourse were made to non-luxury foods.

Theory of Supply of Farm Land†

By VIRGIL L. HURLBURT*

LITTLE attention has been devoted to treatment of theory of supply of land in recent economic literature. From the time of Ricardo, discussion of supply theory has been mainly in connection with or incidental to discussion of theory of rent. The fact of fixity in land quantity and, stemming from that fixity, the idea of inelasticity for the market supply schedule seems to have been accepted as final. In addition, the general tendency for land to be defined as a natural agent—"the original and indestructible properties"—has tended to confuse rather than to enlighten discussions of land income and valuation problems. There is need, currently, for exploration of theory of factor supply, particularly as related to factor pricing and to factor use.

Land differs from other factors, and from the strict definition of capital goods mainly in that it is not reproducible. Although this and other distinctions have clouded discussions of theory, it is not defining the factor that gives rise to difficulties concerning theory of supply. Rather, and more important, is the fact that land, the same as other durable factors, is two-dimensional in its supply character. By two-dimensional I mean that the quantity measurement is both areal and qualitative. It is not only the geographic area but also the intensity of use that determines the effective supply. As developed later in the discussion, an efficacious theory of supply must include the intensity of use facet because it is the quantity of service flowing from land as well as the quantity of land itself that is price determining on the supply side. Land's utility and value are functions of the wants that land satisfies through the goods its help produce. These in turn are functions of the kinds and quantities of other factors used with land in production processes.

Changes in the *intensity* of use in response to changes in product prices have not been generally recognized as constituting a change in use. Discussions of supply have emphasized the fact that land continues in use even though it earns no rent or even if the economic rent is taxed away.

In addition is the problem of defining supply, effective supply, and market supply, and distinguishing between short- and long-run schedules. Too often there is confusion between these terms. Admittedly, in the quantity sense, the total geographic area of land (no matter how defined) is fixed. But this does not necessarily mean that the number of tracts or acres to be offered for sale on the market will not vary with price of land or that changes in relative product prices will not encourage changes in products. Furthermore, people buy or rent land for the service it can provide; and that service is part of the service-supply function, whether or not title to the property is exchanged at a price in the market. In the market-schedule sense the definition of supply of land follows that of other economic goods; the supply schedule refers to the relation between prices and the quantities (area) that owners are willing to sell. The supply price is the seller's minimum asking price.

† The views expressed in this article are those of the author and not necessarily those of the Farm Economics Research Division, United States Department of Agriculture.

* Farm Economics Research Division, Agricultural Research Service, United States Department of Agriculture, Ames, Iowa.

For purposes of this discussion, a land service is defined as any product, good, or output from or associated with land. A service may be a crop such as corn or wheat, space for buildings, or a beautiful view. One need not distinguish between those services that require inputs of other factors (as in the production of a crop) and those services that do not (such as scenery). The essence of the idea involved is that any one tract of land may produce one or more service when land is combined with other factors.

Land is defined in terms of unit area. It includes the natural resource characteristics such as fertility, structure, topography and weather, *and* the added physical inputs incorporated with an inseparable from it. Thus, land is defined in a quality sense at one point of time. It varies through time, with use and treatment, and becomes another quality grade. Land is a genus made up of specie grades. It is distinct from such structural features as buildings and fences but is inseparable from an incorporated improvement such as tile drain or absorbed labor. I make no attempt to distinguish between characteristics as to whether they are man made or natural phenomena. Distinction must be made, however, between land and water, at least in surface area, though not in water content or holding capacity of the soil. Farmland is simply land in farms.

Only a fraction of the total ownership units is transferred in any one time period such as a year, and a high proportion of these is transferred within families and upon terms involving other than market equilibrium prices. Gift, inheritance, and device make up a significant portion of total transfers. This complicates the calculation of actual market price. Furthermore, any one property can be used for a variety of purposes, depending on the interest and capabilities of the owner, and usually can produce more than one type of flow of service. Only in the exceptional case does lack of alternative in production limit the service to one type. In general, there is a high cross-elasticity of demand for the services land can perform. An increase in the price of corn sufficient to raise the price of cornland is accompanied by an increase in price of wheat and in price of wheatland. But there are operational fixities in service production patterns because of the low mobility from one set of services to another. There is a fixity in production patterns for landowners and these owners make up significant parts of both the the supply and the demand schedules for land services.

Supply of any one land service such as corn, within one firm, may satisfy that firm's demand for the land service because the landowner uses his land to produce corn. Firms compete with each other through purchase and leasing for control of cornland. They also intensify production practices on land already under control and change the percent of cropland devoted to corn to obtain more corn when there is an increase in demand for and the price of corn. Similarly with other land services.

The fact that supply of a land service equals demand for the service in many firms adds to the difficulty of defining effective supply and measuring it empirically. On the one hand, land continues in use (say corn) even though annual land costs equal or exceed annual land earnings, in the short run. On the other, an increase in the price of corn and an increase in offering prices for cornland does not necessarily mean an increase in number of tracts or acres offered for sale. Owners choose to retain ownership. The position of the market supply schedule for cornland remains unchanged relative to the market demand

schedule for cornland or, as illustrated by Boulding, the market schedule for the individual seller moves upward but does not change slope.[1]

The effective supply of land is a derived supply. It is a summation of the services land performs. The market supply of agricultural land is a function of the estimates of producers concerning the part that land plays in production processes. More specifically, the market supply is supply of cornland, and of wheatland, and of land for other intended uses. The aggregate for one service is difficult to define because the particular service seldom makes up the whole output of any one firm. Only in a few types, such as cotton or wheat farms, is the firm a single product firm. Thus, changes in ownership to effect production of one service automatically involve changes in ownership of other factors and changes in the production potential for one or more of a combination of products. Also, the supply of the particular product is influenced by the substitutability of one product for another in consumption.

Explanation of the slope and shape of the supply schedule for an individual is the same for land as for any other factor. His schedule expresses his preference for land of a given quality, at a point of time, under a given set of price relations, as influenced by his capital position, liquidity preference, and his estimates of the marginal efficiency of capital in other investments as well as his own peculiar tastes, values, and family situation. As price relations change, as an alternative opportunity ceases or another develops, as his capital position changes or rental opportunities shift, the individual's supply schedule shifts accordingly, reflecting his new preferences. In his own terminology, however, his outlook may be no more specific than that he knows he has some range in price per acre within which he is willing to act.

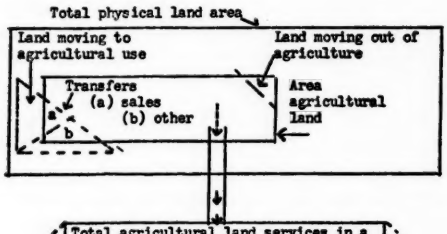
In terms of the flow of service that land can produce, in combination with other inputs, the *services* of land are price-responsive and subject to increase and decrease, and therefore the supply of service is not completely inelastic. Theory of production has long recognized that output of a fixed factor varies with the other inputs combined with it; it is strange that more attention has been given (relatively) to the limitational aspects of "fixed area" than to the variability in service. Only in the sense that area of land is fixed is the supply of land a constant; this is only a quantity expression.

The market supply schedule is the same in concept for land as for any good. It expresses the quantities offered or available at specified prices. These quantities are measured in areas of the earth's surface. But the quantities as such are a function of the particular service that land can produce; and the rate of flow of the service for a given period is a function of the capacity of the land to absorb inputs and the kinds and quantities of inputs applied. The market schedule is a summation of the supply schedules of individuals. But in addition, individuals offer land services at a price through selling the service, such as corn, directly. Thus, the long-run supply of land services is a variable that has peculiar and direct effects on the supply price of land as it changes ownership in the real estate market.

The distinctions between physical quantity of land, physical quantity of agricultural land, the quantities sold or exchanged in a given time period, and the quantity of land services for a time period are illustrated in the following

[1] Kenneth Boulding, *Economic Analysis* (New York: Harper & Bros., 1955).

diagram. Using the definitions given above, it follows that the quantity of land services is a variable, and that the supply of services differs from the supply of land offered for sale in and among production periods.


Total physical land area
Land moving to agricultural use
Land moving out of agriculture
Transfers
(a) sales
(b) other
a
b
Area agricultural land
Total agricultural land services in a given time period; a function of the weather, technology, and quantities and kinds of other factors combined with land.

The market supply schedule for land, at any one point of time, would be upward sloping. At some point it would become vertical, because total supply is offered at some price and no further increase in price will bring forth an additional quantity; supply is exhausted. The market supply schedule is not vertical in the relevant range.

The schedule showing the supply of land services would also be upward sloping and to the right. But it would be more elastic than the supply schedule for land because output of land is a variable; output can be changed from year to year. The supply function of land for a given service could be either more or less elastic than the aggregate market function because of the possibility of shift between uses and differences in elasticities between services. The aggregate function for land services would never become perfectly inelastic because cost returns relations would take effect before the limit of total possible physical production is reached.

The elasticity of the schedule for land itself, plus the elasticity of land services, are supply-price-determining. Ownership or control of the land is essential to control of the services land performs. The elasticity of the service schedule is an important part of the explanation of why land prices vary through time. Changes in the price of corn result in changes in the prices at which cornland is transferred in the market.

For a period of a year or two, the price-quantity relation for land to produce a given service would be a fairly elastic curve in its lower range. It should slope toward the vertical but should never become completely inelastic (vertical). At some high level of price it should slope off to the right again, becoming more elastic at prices above the level of discounted future incomes, reflecting willingness of sellers to exchange land for money when the offer far exceeds their own estimates of land value. Over a period of years the fixed quantity of land area would not be a limit to number of possible sales because each tract might change hands several times. In the long run the supply of land for a given service would be more elastic than in the short run. The difference between slopes of the short-run and the long-run curves for land for a particular use is explainable in the possibility of sale of each property more than once and additional shifts in use with the passing of time. The aggregate market supply curve, however, presumably would be much the same slope in the short- as in the long-run because of the effect of the limited total quantity of land.

The supply schedule of the individual at a point in time, in general, would be upward-sloping, particularly for one who owns more than one property unit. But the continuous function does not quite depict the willingness of an individual to act. As a general rule, an individual decides to sell or not to sell *all* of an ownership unit at some price. Therefore, his

supply schedule is a vertical curve that never touches the horizontal axis because he has some minimum supply price. This minimum price would change from time to time with the individual's outlook and preferences. The multiple property-unit owner would have a series of vertical curves showing willingness to sell one tract at one price and a second one at another price.

The summation of all supply schedules for individuals into a market supply curve at one point of time offers no conceptual difficulties. Nor does the existence of variations in grades of land. The price axis can be seen as an expression of the average for all grades of land. The variation in grades is part of the explanation of the differences between individuals as to their minimum asking prices in that higher quality land would be held at a higher asking price. Also, two individuals would have different asking prices for the same quality of land.

When the reasons for sales of farms are examined it is seen that sellers frequently act under pressure, particularly in timing. Once decision is made to sell, the sale must often take place within some specified time limit. The seller cannot always hold out for his first asking price. Pressures force sales and affect supply prices.

Sellers are aware of what is happening in the market. An occasional seller, nonresident and nonfarmer, may not have information on what is happening in a locality. But local people, particularly owners with land to sell, have fairly well established ideas about the movement of land prices in the market. They know that farms are selling on the average at higher (or lower) figures than last year, or twice as much per acre as 10 years ago. They may not know the details but they do know the general level of land prices. And their asking prices (supply prices) are determined in part by "what they think they can get." Thus market operations as such affect both supply prices and the quantities offered for sale.

The supply price of the individual is affected by changes that have been made in kinds and quantities of improvements and in the level of land productivity. How these changes become reflected in the prices at which real estate moves in the market is a difficult problem in measurement. However, it is obvious that over a period of time what has happened in the form of land improvements (investments) is one of the reasons for change in prices. Possibly the most outstanding illustration of the point is the comparison of land prices before and after an irrigation development. Again, how the individual goes about determining the amount that a given improvement adds to land productivity and therefore to land value varies with the individual, the estimating techniques he uses, his capital position, preferences and alternative opportunities. Supposedly, too, a landowner who is no longer interested in or able to operate the farm himself will choose between sale and renting, depending on price relations and how the two as alternatives fit into his planning processes. The rental market affects both the demand and the supply sides of the titles market. The owner may also dispose of his property by gift or through inheritance. Two-fifths of the estimated total transfers in 1955 were by other than voluntary sale.

The number of voluntary sales and supply prices are affected by the capital gains and other taxes. An owner-operator ready to retire and wishing to sell may postpone the transaction indefinitely because of the sizable amount of capital gains tax that would be due and payable. Also, the capital gains tax

combined with the income tax may encourage sellers to work out payment arrangements that spread payment over a period of years and the payment scheme may or may not affect the sale price.

In a period of favorable farm income, and especially after a series of years of rising farm income, supply prices increase. The longer the period of favorable income, the stronger is the belief that it will continue. Supply prices may continue to increase after the farm income has ceased to increase. If land is in strong hands and few owners are in precarious financial positions, few will be interested in selling, particularly in view of the effects of taxes and lack of more attractive alternatives. In this type of period, the supply schedule of the individual shifts upward. His vertical supply curve has a higher minimum price. This means that the supply curve for the market moves to the right and upward.

There is no annual problem of *replacement* of the land factor. Instead, management decisions are in terms of upkeep, or a fairly low range of allowable or intended disinvestment through such practices as fertility depletion. Inasmuch as the returns from investment in land accrue over a period of years and total agricultural production varies little from year to year, both buyer and seller have an outlook of probability of slow change in land prices as contrasted with an outlook for wide fluctuations in such products as beef. The fact that land and buildings need only be "maintained" during the production period, or over a period of years, makes their prices less subject to change—contributes to stability in their prices. This type of price relation has further significance when it is remembered that supply, demand, and price are mutually determined and all are influenced in the long run by such general forces as the level of employment, international trade, and the like.

Each individual owner or prospective owner of real estate apparently has two concepts of value of land as a factor. First is the concept of a flow of income over some range of time. Second is the idea of a fund of value at some indefinite date in the future. Thus, an individual can visualize his own capital position as made up of these two parts and the sum of these parts may be less, equal to, or more than the unit market price of the present. And so long as his equity value, which is disposable on the market, is greater than the market value of the whole property minus his obligations, his capital position is safe even though his operations as a firm may not be. That is, one of his objectives in the firm is to stay in business. Therefore, he must have sufficient annual operating capital to do so and the investments in fixed assets as well as those in annual operations affect each other. The idea of a fund value for land is of particular importance also in the savings practices of owner-operators, particularly those who expect the real estate investment to support them after retirement or to be the main form of inheritance for their children.

No one can predict what the individual will do regarding the valuation of real estate or the pricing of land. But theory does offer the individual a framework for deciding what to do in determining his asking or offering price. Admittedly, some of the tacit and explicit assumptions of strict theoretical models are departures from reality. Knowledge is imperfect. Prices and production are uncertainties. Also, individuals do not necessarily behave as the theory specifies, to achieve given objectives. For example, an individual buyer or seller may not attempt to distinguish between the composites in the real estate bundle in

his pricing process. That is, he may price the farm as a whole, rather than pricing the land, buildings, and improvements separately. Nevertheless, these departures in practice do not deny the possibilities of improving the market functions by following the theoretical constructs.

Significance of the Supply Concept

The supply concept is of little use to the individual other than helping him understand the operation of the market and some of the reasons why land prices change the way they do. Such understanding may assist him in making wiser choices between alternatives, including choice between valuation practices, purchase (or sale) versus renting, and the like. Its main utility is in application in public programs. For example, any land-retirement program using either public purchase or rental designed to adjust agricultural production, must be premised on knowledge of elasticities of land services.

The "fixed" total land area and the relatively "fixed" area of agricultural land are quantity terms—physical measurements. Land supply, in any economic or market context, involves quantities available at varying prices and, as discussed above, the effective supply is a function of intensity of use as well as of the physical area measurement. Total "fixed quantity" of land available for agriculture is not a strategic limiting factor in the national economy. The limits come in terms of cost and price relations within and between land services. We still have much to learn about how agricultural product prices, contract rents, land prices, and changes in these prices affect land uses and land transfers.

Reports and Comments

Observations on Foreign Trade in Lumber†

Introduction and Perspective

THE TIMBER industry ranks high among primary sources of income in Washington and Oregon and across the international boundary in British Columbia its dominance is even more outstanding. The significance of the industry results in the economy of the Northwest being sensitive to fluctuations in the lumber-using industries, which are among the nation's most volatile. The region is, therefore, more affected by general economic fluctuations than is the economy of the United States as a whole.[1] Probably the best evidence of the uncertainties of lumber is found in the fluctuating market of its major use. Between 50 and 75 percent of all lumber produced is used in building and construction.[2] In 1929, 21 billion board feet of a total consumption of 35.8 billion were so used, but this dropped to 6.5 billion in 1932 and returned to an all-time high of 31 billion board feet or 74 percent of total consumption in 1950, during the postwar building boom. The dependence on lumber production, in addition to posing problems of cyclical instability, also causes concern for long-run stability inasmuch as a significant regional dependence on an exhaustible resource always raises a question of secular structural weaknesses.

Although the interest of this paper is chiefly with lumber production and trade as they affect the economy of the Pacific Northwest, admittedly these cannot be satisfactorily separated from production and trade of the United States as a whole. The two major lumber-producing states of the Northwest, Oregon and Washington, annually supply together between 25 and 35 percent of the lumber produced in the United States. This production is largely softwood but hardwoods contribute about 19 percent in volume to the annual output. Between the two states there has been a long-run shift in relative position. During the early years of the interwar period Washington outproduced Oregon by a considerable amount; whereas, since the latter thirties, Oregon's production has surpassed that of Washington, as the center of forest harvest in the northwest has moved southward into Southern Oregon and toward the California border. To illustrate: the peak production of lumber in the United States during this decade was approximately equal in volume to that of 1923 at about 41 billion board feet but Washington's share declined from about 6.7 billion to 3.8 billion board feet over the two decades while Oregon's share increased from 4.0 to 8.4 billion and California's and Nevada's together from 2.0 billion to 5.1 billion.[3]

The share of total production from the combined areas of Oregon and Washington has grown from 24 percent in 1923 to 32 percent in 1953. Oregon alone has increased its share over these three decades from 9.8 percent to 23 percent of total output. The expansion of population of the west, the improvements in transport facilities and declining reserves elsewhere, especially in the Lake States, have been instrumental in encouraging westward expansion.

A highly specialized region necessarily involves itself in much interregional and international trade and the major markets for Northwest lumber lie at some distance from the producing region, mostly in the densely populated and expanding areas. Also, a significant, but not dominant, share of the market for lumber has traditionally been

† The author is indebted to Joginder Sahota of the Department of Economics, University of Oregon, for assistance in the preparation of this paper.

[1] For an informative and interesting account of forces affecting income levels in the Pacific Northwest, see Paul Simpson, *Regional Aspects of Business Cycles and Special Studies of the Pacific Northwest* (Eugene, Oregon: University of Oregon, 1953), mimeograph, pp. 59-69.

[2] *Lumber Industry Facts 1950* (Washington: National Lumber Manufacturers Association), p. 27 (hereafter referred to as *Facts*). The category "Building and Construction" includes all construction except that by railroads. Other categories, in order of importance in 1947, are "boxes and crating," "industrial," "railroad," and "export."

[3] *Statistical Abstract of the United States* (Washington: U. S. Government Printing Office).

outside the United States and, although only about three percent of the domestic lumber production is annually marketed abroad, about one-half of that lumber is shipped from the Northwest. It is this segment of the lumber trade which is examined here to determine forces making for strength and weakness in this market and to assess the future of foreign trade in lumber for the country as a whole and particularly for the Pacific Northwest. The cyclical and long-run trends in the behavior of lumber imports and exports, and the regional patterns of trade, should throw much light on the impact of international trade on the lumber-producing areas. This short survey is concerned only with lumber and omits some considerations important to the timber industry, since only about 52 percent of the timber product is in lumber.[4]

In our concern with foreign trade in lumber, two facts should be borne in mind; first, the major market for United States produced lumber is domestic and second, only about seven percent of the domestically-consumed lumber is imported. Foreign producers for the United States market, being a small part of the supply, can have little affect on the total supply picture and must adjust supply to demand conditions here. On the other hand, foreign purchasers must compete with United States buyers in bidding for lumber, and export prices are for the most part the result of domestic circumstances, i.e., internal costs and demand. To illustrate; during the last prewar year, 1939, the total value of United States produced lumber was approximately $632 million, of which $41 million, or only 6.5 percent, was exported. During a more recent year, 1947, total production was valued at about $2 billion, with exports valued at $60 million or three percent of output. This relative decline in the export trade is, as will be demonstrated below, a trend which had been going on since the early 1920's and is one which may ultimately remove the United States from the lumber export market.

The relative significance of lumber imports has moved in the other direction. From $20 million, or 3 percent of production in 1939, imports had by 1947 reached $101 million or five percent of the value of lumber production. With regard to changes in real national income, and as will be discussed below, lumber imports have grown as income has increased but this has not been true of lumber exports. That lumber imports should be closely correlated with the level of income is consistent with recent studies of the import-income relation and this relationship would appear to be particularly relevant to a commodity involved in the vascillating construction industry.

Trade data reveal that the exports of lumber declined from a value of $115 million in 1929 to $27 million in 1932, while the value of imports stood at $8 million in 1932 as against $44 million in 1929.[5] In volume, exports reached a low during the depression of 1.2 billion board feet and imports one of 287 million board feet two years later. By 1939, when national income stood at 171 percent of its depression low, lumber imports had risen two and one-half times and exports to one and one-half times their 1932 level in current dollar value. By volume, imports in 1939 were twice their depression low, while exports increased to 1.4 billion board feet in 1937, only to decline again in 1938, and not again to regain even the 1932 depression level. In each case the price had risen substantially, approximately to predepression heights. That exports did not show as much recovery as did imports can be attributed to a number of factors, among them are the greater upsurge in United States economy than abroad and the barriers and preferences constructed during the depression against United States goods generally, including lumber.[6]

It is significant that, during the depression, lumber prices generally exhibited considerable "stickiness," declining only about 40 percent between 1929 and 1932, while domestic lumber production was reduced by some 66 percent.[7] Likewise, when production and

[4] *Timber Resources Review* (Washington: U. S. Government Printing Office, 1955), p. 2.

[5] *Statistical Abstract of the United States*, 1955, pp. 717, and *Historical Statistics of the United States 1789-1945*. (Washington: U. S. Government Printing Office, 1949), p. 125. For purposes of dealing with lumber the Department of Commerce lists hardwoods and softwoods separately, with the latter comprising annually about 80 percent of total production. Lumber imports are listed as "boards, planks and deals" and the average "foreign" price per thousand board feet is given. Exports are designated "boards, planks and scantlings" and the prices are at point of shipment.

[6] See Ivan M. Elchibegoff, *United States International Timber Trade in the Pacific Area* (Stanford, California: Stanford University Press, 1949), pp. 213-221.

[7] *Historical Statistics of the United States 1789-1945*. The prices used here are "U. S. average of all sales f.o.b. the mill." Recent data are "export prices" from *Statistical Abstract of the United States*.

exports were on the upgrade during the period of recovery, it was in volume that significant changes were made and not until after the beginning of the War when production reached its peak did the "mill" price exhibit much upward pressure. Following World War II, however, prices have increased substantially even after correcting for the reduced value of the dollar, whereas production has reached only a level approximately equal to the highest interwar year. It would appear that over the long-run and, at about 40 billion board feet, the domestic supply becomes relatively insensitive to price changes, whereas during major swings of the business cycle considerable fluctuations below peak production result from changing demand. Also, over the long-run it is the price which is volatile while for short-run cyclical fluctuations adjustments to changing demand conditions are usually made in the levels of production. In this regard the lumber industry follows the general proposition that excessive inflation occurs after full production is attained.

Lumber Exports

Regarding the destinations of United States lumber exports, a number of "natural" features of the Northwest are relevant. Foremost, of course, is the easy access of west-coast lumber to water transportation routes and the obvious advantage of the area to the Far East and the South Pacific markets. It is this same cheap transportation which provides much of the means by which Northwest lumber reaches California and the Atlantic seaboard. This feature gives western lumber certain competitive advantages in the east over the central producing states, but its location places it at a disadvantage in some major markets accessible only by overland transport.[8]

Before World War II lumber exports of Washington and Oregon were shipped in large quantities to the Far East and the South Pacific, with Japan, China and Australia the major customers. Important export markets outside these countries were the United Kingdom and the countries of South America. During the depression a significant shift took place as Japan lost its leadership and European markets became relatively more important. The changes in position were largely the result of Japan's reduced foreign trade rather than important growth elsewhere for, out of the depression and efforts at self-sufficiency, all markets for lumber were reduced in strength but that of Japan more so than most others and with considerably less recovery in the late thirties. Likewise, the recovery of lumber exports as a whole failed to keep pace with the recovery in economic conditions generally and has tended to remain near or below the depression depth since the debacle.

An interesting competitive situation exists between the United States lumbering interests and that of Western Canada. British Columbia lumber products are nearly identical to those of Oregon and Washington and it has annually since 1934 exported a larger volume of lumber than have the two states. Before the great depression British Columbia trailed both Washington and Oregon in most years in lumber shipments and always exported less than the two combined. Part of the growth during the late depression days can be attributed to the preferential arrangements made among countries of the British Empire. For example, in 1939 British Columbia exported 1.3 billion board feet compared to 263 thousand board feet for Washington and 139 for Oregon, 93 percent of which went to the United Kingdom, Australia and Africa. Each of these was a part of the imperial preference system and each had agreements with Canada on lumber exports. Comparatively little of that sent from Canada was destined for the United States or its outlying prossessions.[9] The growth of Canada's lumber exports trade at a time when the United States production was yet far below capacity appears to be one of the developments following in the wake of the protectionistic policies of the inter-war years.

Lumber exports manifest interesting long-run tendencies as well as cyclical responses. For the first decade of the interwar years there was a growing volume of lumber exports and at prices which were relatively stable. A rapid decline began after the onset of the depression. By 1932 exports were down 52 percent, prices were off 42.6 percent of the 1929 level and domestic production was down 72.4 percent. These might normally be attributed to cyclical forces except that the recovery made in national income was only slightly noted in lumber exports; in fact, lumber exports in 1939 were actually less

[8] Elchibegoff, *op. cit.*, pp. 202-207.

[9] *Circular* (Seattle, Washington: Pacific Lumber Inspection Bureau, Inc.) Data on waterborne shipments are published in the Annual *Circular*.

than those of 1932. This failure to expand can be imputed to the failure of international trade in general to recover and to the growth in Canadian exports which took over part of our former foreign markets.

Returning briefly to the roles of Washington and Oregon, we note an interesting development taking place in exports. In 1929 Oregon's exports constituted 17 percent of the total of that of the United States while Washington contributed about one-third. By 1947, the highest postwar year, Oregon accounted for 37 percent and Washington 18 percent of the export, together constituting some 55 percent of the United States lumber exports. The growing importance of Oregon as an exporter reflects basically its growth as a producer and, although only about 4 percent of its production is sold abroad, that is substantially higher than for the industry as a whole.

TABLE I—LUMBER EXPORTS AS A PERCENTAGE OF PRODUCTION

	1923	1929	1932	1939	1952
Oregon	10.7	11.4	9.6	2.9	3.9
Washington	11.4	14.6	16.9	6.2	3.1
United States	6.0	8.3	8.5	3.8	1.9

Sources: Calculation from data contained in *Historical Statistics of the United States, 1789-1945*, p. 125; and *Statistical Abstracts of U. S.* 1955, p. 17. Export figures for Washington and Oregon from *Circular* Pacific Lumber Inspection Bureau, appropriate years.

Two characteristics of the postwar period seem to reflect the changing picture of exports in the lumber business. First, the decline of the so-called "natural" markets—Asia, South America and Australia—as major importers of softwoods and second, the fluctuations in exports aside from the cyclical forces which dominated the changes during the interwar years. During the last four pre-depression years, total export of softwood lumber was 10.7 billion board feet while two decades later, and when the economic picture was considerably brighter, lumber exports totaled only 2.5 billion board feet (1946-1949 inclusive). Only during one postwar year were lumber exports comparable to the years before the war and that was 1947 when the export volume equaled that of 1946 and 1948 combined. This singular exception can be accounted for by conditions peculiar to that year alone.

The unusually large export of lumber during 1947 is explained almost entirely in terms of those forces causing the United Kingdom to increase its imports, for that market received some fifty percent of Northwest lumber exports during 1947 instead of the usual 20 percent. This large and one-time only increase reflects the reconstruction boom in British war-demolished housing which got underway rapidly but had to be curtailed when the dollar problem became acute.[10] There were certainly no reasons to expect this extremely high level to continue long but one might logically expect to find from this experience some positive relationship between the quantity of lumber exports and the world supply of dollars. Interestingly enough, this appears not to be the case for in those years of a large foreign dollar supply lumber exports exhibited some inclination to decline. The most glaring general proposition seems to be that the factors making for high income level tend also to bid the domestic *and* the foreign supply away from other markets and these coincide with forces which make for a large dollar supply abroad. That is, a high-income level in the United States results in large imports and a large supply of dollars abroad but this accompanies a high level of domestic building activity and rising lumber prices.

The questions posed by this perusal of export data are these: Is our competitive position in lumber declining as our position in the export of raw materials has been prone to do over the long run? Is anything revealed concerning the elasticity of demand for our lumber exports? The following observations seem relevant, though by no means are they definitive answers to these questions.

There is a very definite positive correlation between economic activity and lumber exports when major fluctuations are involved. However, if fluctuations over the last three decades had been *only* cyclical we should expect postwar exports to return to their prewar level as domestic business has recovered. With the exception of 1947 the volume of lumber exports has not returned even to the 1932 level, to say nothing of the 1929 high. This, it seems certain, is a manifestation of a long-run trend in lumber exports where United States production is playing a small part in international trade and bodes well to play an even lesser one in

[10] "Housing Progress in Britain," *Labor and Industry in Britain*, March 1949, pp. 25-28.

the future. Factors leading to this conclusion are: (1) Total United States lumber production in 1953 was at approximately the same point as it was three decades earlier. (2) The average unit price at point of shipment of softwood lumber decline from $32.27 per thousand board feet in 1929 to $20.35 in 1932. This price was not reached again until during World War II but since the war it has been continually climbing until in 1953 it was listed at $94.34. Of significance also is the failure of domestic production to respond to the rising price while during the depression changes in production was the major adjusting mechanism. Lumber consumption has continued to grow; and prices have risen but as production has probably reached its peak there is little reason to anticipate future annual output greatly to exceed the 41 billion board foot mark, regardless of what happens to the price. This can only mean less exports or more imports or a combination of the two.

Since exports have never constituted more than a small segment of the lumber market their volume is more likely to be affected by the domestic price than would price be a function of the foreign demand. For example, the high price during recent years would have to be explained in terms of all these factors affecting the general domestic price level together with the particular demand for building materials. Deficit financing, easy money, increased population, federal encouragement of housing, together with the low level of construction during the depression and war, have resulted in a strong demand on the construction industry. The insensitiveness of the lumber supply curve to a rising demand could result only in a strong surge upward. Using again the export price of softwood lumber as the basis of comparison, we note that lumber prices in 1953 were up 349 percent above 1933 while the consumer price level was up only 68 percent for the same period.

It is perhaps impossible to arrive at satisfactory measures of the elasticity of foreign demand for United States lumber, either income or prices, because of limited income data available in other countries but careful observation suggests that foreign buyers are somewhat sensitive to relative price changes. As the United States export price has increased more than the foreign price, the dollar value of lumber exports in recent years has not reached that of the 1920's even in today's depreciated dollar. Undoubtedly, a large part of this export demand elasticity is due to alternative sources of lumber, particularly the growth in the exports of Canada. The high prices in the United States have encouraged production abroad both for exports to the United States and to former United States markets abroad. This suggests that Canada is replacing the United States in many of the markets overseas and making significant inroads into the United States market in spite of past restrictions designed to assist the domestic producer.[11]

In 1929, to make the point, the volume of lumber exported by British Columbia (*not* to United States) constituted only 23.7 percent of the combined shipments of Oregon and Washington. By 1947, however, British Columbia's exports were 148.8 percent of these two states. The major destinations for Canadian lumber were United Kingdom, Australia, Africa, Holland and China, in that order, with a lion's share (67 percent) going to United Kingdom.[12] And, while it is probably true that 1947 tends to overstate the importance of United Kingdom for reasons noted above, the pattern for other years is not significantly different; that is, British Columbia annually out-shipping the western part of the United States and with its major markets in the Commonwealth.

It appears not improbable that, so long as United States national income level remains high, population increases and building loans remain available, foreign areas will gain in international lumber trade, both by absorbing our foreign markets and by selling in this country. The unwillingness of our industry (perhaps inability, due to competing demands for our factors and limited resources) to expand output provides improving opportunities for other producers to sell in world markets. One might well look ahead a few years to the time when our lumber will vanish from the export category, except for some border trade, and lumber imports become an important source of domestic supply. It is this other aspect of the lumber trade—our growing imports—that will now be examined.

---

[11] The Smoot-Hawley Tariff imposed a duty of $1.00 per thousand board feet and the Revenue Act of 1932 imposed a $3.00 per mbf duty. Each of these has been reduced by 50 percent through negotiations which, together with the inflationary trends of the times, have rendered this restriction relatively unimportant.

[12] *Circular* (appropriate years).

United States Lumber Imports

Until rather recently the United States has annually exported considerably more lumber than has been imported. However, if one projects the postwar trends in production, imports and exports, it is imports which seemingly will bode most significant for future growth. The expanding domestic needs, the depletion of much of our better timber resources, together with Canadian developments, are among the important forces bearing on this issue.

Inasmuch as lumber is closely asscciated with the durable goods industries, considerable cyclical variation exists in the level of lumber consumption which, in turn, affects the level of production, income and lumber imports. For example, when "real" national income declined from $87.3 billion to $52.5 billion between 1929 and 1932 (1929 dollars), total lumber consumption fell from 36 billion board feet to 13 billion, a decline of 63.9 percent as against 40.2 percent in real income. The major share of this consumption decline was in the category of "building construction."[13] Lumber imports declined to even a smaller share of their predepression level, or by some 75 percent. These observations suggest a high income elasticity of demand over-all and a higher one yet for imported lumber. That one would expect to find a reduction in lumber imports is understandable; that it was percentage-wise greater than consumption should not be surprising considering the general breakdown of foreign trade, as exchange controls, quotas and preferences became the style of the early 1930's.

For future consideration these facts are important: (1) Our imports, like our exports, are chiefly softwood lumber. (2) The largest source of our lumber imports has, through the past decades, consistently been Canada. (3) The majority of Canadian exports to the United States, (spruce, pine and douglas fir products in softwoods, and birch, beech and maple among the hardwoods) are produced also within the United States. (4) Although the volume of imports has noticeably increased, it is still only a small percentage of lumber consumed within the United States, but has usually shown perceptible increases when incomes and prices rise. The recent inflationary pressures and falling foreign relative price have resulted in a marked increase in the volume and value of imported lumber. Most of this increase, as noted above, has been from Canadian sources, where obvious advantages of location and natural resources place her in favorable relationship to our markets. In 1952, of 2,226,945 thousand board feet of softwood lumber imported, 94.4 percent came from Canada, and of the 214,680 thousand board feet of hardwood lumber imported, 82.8 percent was of Canadian origin. Other sources of lumber imports are the Philippines and Mexico, with the former of these showing some growth in hardwood exports, but from a total quantity point of view each is relatively unimportant.

In order to provide statistical measures which might prove helpful in predicting future imports, I have correlated real income of the United States with the volume of lumber imports for both the interwar and the postwar periods. A simple correlation reveals that between 1923 and 1939 some 56 percent of the fluctuations in lumber imports can be thusly accounted for. Our data also suggest that relative prices were in an important way responsible for the growth in imports during part of that period, perhaps equally so with income, but this variable should probably not be considered separately and independently of income fluctuations.[14] The relative foreign price increased at the outset of the depression and tended to fall thereafter but these changes appear to have been largely another resultant of the domestic business fluctuations. Other forces which undoubtedly played a role in lumber imports were the protection provided the timber industry against outside competition and the direct and indirect subsidies to home construction.

It is also interesting that during the immediate prewar period, when national income returned to the height attained in 1929, the volume of lumber imports approximately doubled and with only a 39 percent increase in price. These brought about an increase in expenditures for foreign lumber of 187 per-

[13] *Facts*, 1950, p. 27.

[14] It is patently unrealistic to compare "foreign price" with the "domestic" or "export" price in absolute terms. However, changes in relative prices do provide a reasonable basis for comparison. For an interesting discussion of one method see J. Hans Adler, "United States Import Demand During the Interwar Period," *American Economic Review*, June 1945, pp. 418-427. For the purpose at hand I have used the domestic "normal price index," (see *Timber Resources Review*, p. 9), and an index of the foreign prices as given in the *Statistical Abstract of the United States*, converted to the 1926 base.

cent over the depression low and at the same time domestic production was expanding by 150 percent. From these factors one gleans a supply curve quite in contrast with the postwar period, as during the late thirties the adjustment both of imports and production was largely quantitatively made, with price realignments less important.[15]

Not until 1948 did the volume of lumber imports achieve the predepression level, and the decline in imports which accompanied the 1949 income drop signaled anew the sensitivity of lumber imports to changes in domestic income. When one compares the consumer price index of 1948 with that of 1926, and lumber price indices for the same years, considerably less fluctuation is noted in the former than in the latter. During the postwar period lumber prices have been particularly volatile, much more so than have prices generally. Expansion of demand appears more likely to result in substantial price rises, suggesting that at the present level of production a low supply elasticity.

During the postwar period the fluctuations in income appear again to account for most of the fluctuations in lumber imports. Although a high correlation exists between the falling foreign relative price of lumber and the quantity imported, I believe again this phenomenon to be a function of the rapidly rising domestic prices and a more slowly rising one abroad, without a concomitant growth in production. If, as the analysis suggests, this denotes the existence of an inelastic supply curve and a demand curve much affected by the shifts of income, we must expect a considerable growth in imports in the future if income expansion continues unabated.

TABLE II—INDICES OF NATIONAL INCOME, LUMBER IMPORTS AND PRICES, UNITED STATES: 1929-1953 (Selected Years) (*1929=100*)

	1929	1932	1939	1948	1953
[1]Real National Income.....	100	52.4	89.5	161.3	195.4
[2]Lumber Import...	100	24.7	46.5	121.8	179.5
[1]Consumer Prices...	100	79.6	81.0	140.2	156.1
[1]Unit Price-lumber.	100	80.1	97.6	286.7	302.1
[2]Lumber Export....	100	36.2	39.5	20.2	83.6

Sources: [1]*Statistical Abstract of the United States.*
[2] *Lumber Industry Facts*, National Lumber Manufacturers Association.

From a regression line established from the postwar data, the safest prediction one can make about future imports of lumber is that they will continue to grow, and perhaps at an increasing rate. In the absence of serious economic crisis, war or effective restrictive measures, we may expect lumber imports to become an ever greater share of total consumption, and perhaps within a decade lumber imports will provide some 20 percent of our lumber needs instead of the 5 percent as at present.

MARSHALL D. WATTLES

Department of Economics,
University of Oregon,
Eugene, Oregon.

[15] Analysis of lumber imports for the war years has been omitted on the assumption that restrictions and controls required for a war economy do not lend themselves to the kind of economic prognosis here engaged in.

Comparative Performance of Electric Utilities Under State and Under Local Rate Regulation

ALMOST a half-century ago, in a utility rate case, a jurist said, "It is well known by all informed men that city councils necessarily adopt rates with but little or no investigation as to what rate ought to be fixed. The result is that we have ordinances fixing rates based upon little intelligent effort for the ascertainment of the facts."[1] A few states still do not regulate rates of privately-owned electrical utilities at the state level, preferring to rely upon local regulation.[2] This raises the question of which form of regulation, state or local, best serves consumers (that is, which results in lowest rates or is most likely to prevent "excessive" profits). Although varying geographic and economic conditions may make an absolutely final answer to this question difficult, if not impossible, it is perhaps possible to reach some tentative

[1] *Des Moines Water Company* v. *City of Des Moines*, 192 Fed. Rep. 193 (1911).

[2] In Iowa, South Dakota, and Texas, municipalities have the right to regulate and fix such rates. Certain Minnesota municipalities, according to their charter provisions, also have the right to fix or to regulate electric rates. Mississippi gave general regulatory authority to its Public Service Commission only in 1956. In several states also rates of various other traditional public utility businesses either are not regulated or are subject only to local regulation. This article, however, is concerned only with electrical utilities.

conclusions from a comparison of balance sheets and income statements of utilities regulated by local authorities with those of comparable utilities regulated at the state level. That was the purpose of a recent study made by the author.

In order to get the minimum economic variations from differences in geographical locations, a comparison was made between six large electric utility firms (each serving one or more large population centers or several score smaller communities and adjacent areas, or both) operating wholly within the state of Texas and thus subject to local rate regulation only, with five large electric utility firms operating wholly outside Texas but in states adjoining Texas which have rate regulation at the state level. Each of these eleven firms receives all or virtually all of its revenues from the sale of electricity. It should be noted, further, that this selection of firms includes all firms in Texas and in states adjacent to Texas which meet the standards described above and that nowhere else in the United States can as many firms meeting these standards be found in adjoining states.

To minimize possible accounting differences, financial data published in Moody's *Public Utility Manual* (Compiled by Moody's from company reports to the Federal Power Commission) formed the bases for the author's computations reported below. To get a more even cyclical picture, a five-year period (from 1951 through 1955) was used.

The largest company of the eleven studied, both in terms of average end-of-year assets and of average annual total operating revenues, is a Texas company while the two smallest of the group are non-Texas firms. Also, the aggregate end-of-year assets and the aggregate total operating revenues of the Texas firms were somewhat larger than those of the non-Texas group. The largest non-Texas company, however, in terms of assets and revenues, was larger than the five smallest of the six Texas firms; the second largest non-Texas firm was larger than the three smallest Texas firms; and the third largest non-Texas concern was larger than the two smallest Texas companies. In other words, the Texas and non-Texas firms are fairly well mixed by size when combined within a single array.

Table I gives a comparison of the total and net operating revenues and the net incomes as a percent of total end-of-year assets of the six Texas and the five non-Texas firms as averaged over the five-year-period.

Scrutiny of Table I reveals that in net income as a percent of assets the third and second largest firms (in terms of assets), in order, ranked highest both in the Texas and the non-Texas group. The same relationship existed in the non-Texas group for

TABLE I—Comparison of Total Operating Revenues, Net Operating Revenues, and Net Incomes as Percentages of Total Assets, Six Texas and Five Non-Texas[1] Privately-Owned Electrical Utilities: 1951 Through 1955[2]

Total Operating Revenue as a Percent of Assets		Net Operating Revenue as a Percent of Assets		Net Income as a Percent of Assets	
6 Texas Firms	5 Non-Texas Firms	6 Texas Firms	5 Non-Texas Firms	6 Texas Firms	5 Non-Texas Firms
22.91%	21.21%	10.94%	8.34%	4.68%	3.37%
21.24	23.27	10.22	9.34	4.83	4.12
23.44	24.70	11.29	10.19	5.16	4.64
23.81	20.16	9.88	8.14	4.49	3.11
22.46	29.94	10.01	7.53	4.19	3.08
22.55		9.76		4.32	

[1] All in states adjacent to Texas, and with state regulatory control over rates.

[2] Source of figures used in computations: Moody's *Public Utility Manual*, various years. Average annual total operating revenue, net operating revenue, and net income for each firm divided by the firm's end-of-year assets as averaged over the five-year period. Firms ranked in descending order according to size of average end-of-year assets.

net operating revenue as a percent of assets while in the Texas group numbers three and one, respectively, ranked highest. In total operating revenues as a percent of assets, numbers five and three of the five non-Texas firms and numbers four and three of the Texas group were highest. It should be pointed out, incidentally, that number five of the non-Texas group also is the smallest of the eleven firms studied.

Further, if the eleven firms of both groups are combined into a descending array according to assets (not shown herein) it will be found that the smallest firms in terms of assets also have the lowest net incomes and net operating revenues as a per cent of assets. The two largest firms, on the other hand, rank third and ninth in net income and second and ninth in net operating revenues as a percent of assets. The five highest ranking firms in terms of net income as a percent of assets are, in order of assets, numbers four, three, one, six, and eight.

If net incomes and net operating revenues as a percent of assets are considered as being measures of efficiency, then Table I and the foregoing two paragraphs appear to indicate that neither the largest nor the smallest of these firms, whether viewed as two groups (that is, Texas and non-Texas) or as one group, are the most efficient operators. Instead, the "middle-sized" group appears to be most efficient. This conclusion coincides, of course, with the well-known economic principles of variable proportions as well as with the general conclusions of most empirical cost-efficiency studies purporting to compare "small," "medium-sized," and "large" firms.[3]

As mentioned above, aggregate assets and total operating revenues of the six Texas firms average somewhat higher than those of the non-Texas group but the non-Texas and Texas establishments are fairly well mixed by size when combined within an array. It does not appear, therefore, either from economic logic or empirical observation, that either the Texas group or the non-Texas group should necessarily have any inherent cost advantage over the other due to economies of scale. The "net-income-as-a-percent-of-assets" figures of Table II below, however, clearly indicate that the Texas firms studied, do in the aggregate, have a definite advantage over the non-Texas group in terms of profits. What can account for this?

The difference between the average price per k.w.h. sold by the Texas and the non-Texas group (as shown in Table II) at first glance may not appear statistically significant. When one considers that this difference is more than one-tenth of a percent per k.w.h. (or more than seven percent higher for the Texas than for the non-Texas group), however, and that we are dealing with billions of k.w.h.s per year, this price difference appears to be of considerable significance.

The second item of Table II, k.w.h.s sold per average dollar of assets, indicates a considerably better utilization of assets by the non-Texas firms than by the Texas group. One can only speculate concerning the cause of this situation. It may be because of inherently better management possessed by the non-Texas group. Or the Texas firms may have expanded their facilities further ahead of their existing markets than did the non-Texas firms during the period under study (in this case, though, as unused assets would have increased without a corresponding immediate increase in revenues, one would expect net operating revenues and net incomes as a percent of assets to be decreased as a result). It may be that more effective (state) regulation of the non-Texas firms forces them to make better use of their resources in order to maintain a satisfactory level of earnings. Or this apparent difference in the efficiency of asset utilization may have arisen from some other cause or causes not apparent to the author.

Comparative Performance

Comparative figures of total operating revenues as a percent of assets, although slightly favoring the non-Texas group, again, do not appear at first glance, to indicate a statistically significant difference. It must be remembered, however, that this small difference is the result of a combination of *lower* selling prices and a *higher* degree of resource utilization on the part of the non-

[3] Excellent short theoretical discussions of the relationships between size and efficiency are found in Emery Troxel, *Economics of Public Utilities* (New York: Rinehart and Company, Incorporated, 1947), pp. 29-37; and Martin G. Glaeser, *Public Utilities in American Capitalism* (New York: The Macmillan Company, 1957), pp. 408-409. W. L. Crum, *Corporate Size and Earning Power* (Cambridge: Harvard University Press, 1939) shows relationships between size and earnings for a large number of firms in a variety of industries. This latter study, incidentally, notes a much smaller variation in the rate of earnings of different sized utility corporations than that found in most other industries—this *possibly* can be explained in terms of public regulatory policy, of course.

TABLE II—SELECTED COMPARATIVE DATA COVERING SIX TEXAS AND FIVE NON-TEXAS (IN ADJACENT STATES) PRIVATELY-OWNED ELECTRICAL UTILITIES: 1951 THROUGH 1955

	Texas Firms	Non-Texas Firms
AVERAGE PRICE PER K.W.H. SOLD OVER 5-YEAR PERIOD, IN CENTS (total electric revenues divided by total k.w.h.s sold)	1.647	1.537
K.W.H.s SOLD OVER 5-YEAR PERIOD PER AVERAGE DOLLAR OF ASSETS (total k.w.h.s sold divided by total of average end-of-year assets)	67.58	73.24
TOTAL OPERATING REVENUES AS PERCENT OF ASSETS (weighted average, all firms) OVER 5-YEAR PERIOD	22.71%	22.90%
NET OPERATING REVENUES AS PERCENT OF ASSETS (weighted average, all firms) OVER 5-YEAR PERIOD	10.50%	8.97%
NET INCOME AS PERCENT OF ASSETS (weighted average, all firms) OVER 5-YEAR PERIOD	4.68%	3.73%

Texas group as compared with the Texas group.

Net operating revenues as a percent of assets do show a significant difference in favor of the Texas firms. Again, one can only speculate as to the cause or causes. Can it be that a fuller use of resources by the non-Texas group results in higher per unit operating costs? In an electrical utility, commonly supposed to be subject to decreasing costs with a given plant, one would expect the contrary to be true! Or can it be that the larger sized (in the aggregate) Texas firms are able to take better advantage of economies of scale than are the non-Texas firms? As suggested above, this certainly is not apparent. Although the Texas firms are larger in the aggregate, the two groups are well-mixed as to size and it might be expected too that diseconomies as well as economies of scale would be operative. Is it possible that fuel costs (which are a fairly substantial portion of total costs of steam generated electricity production) may be lower for the Texas than for the non-Texas firms? Due to the availability of low-priced oil and gas in Texas this latter conjecture appears probable although it cannot be demonstrated from the data available; in such a circumstance, however, if "other conditions' (including the stringency of regulation) are "substantially equal," one would expect to find such lower operational costs reflected in lower prices for the Texas product rather than in higher net operating revenues for the Texas firms. Differing degrees of concentration or dispersion of the population served might affect the costs of providing services. But again, why would any Texas advantage in degree of concentration (assuming, for the sake of argument, that such an advantage exists) not be reflected in lower prices if the Texas and non-Texas regulation is equivalent in its effect?

Net income as a percent of assets, as one would expect from the net operating revenue's picture, is significantly in favor of the Texas firms. In a relative sense (that is, based upon the percentage figure shown for the non-Texas group) the average net income figure for the Texas firms is more than twenty-five percent greater than that of the non-Texas firms.

It is interesting to note that a recent study by Professor Fred P. Morrissey of the rates of return of seventy-seven of the nation's largest electrical utilities during the decade ending in 1955 reveals that the seven Texas firms included in that study had a higher average percent return on common equity than was found in any other state (almost forty states being included), and was exceeded in only one state (where only one firm was studied) in average percent return on total capital.[4] Professor Morrissey suggests

[4] See Fred P. Morrissey, "Relation of Growth and Rate of Return for Utilities," *Public Utilities Fortnightly*, September 12, 1957.

that, "by design or otherwise," regulatory Commissions have permitted rapidly growing firms to realize higher earnings than less rapidly growing organizations (although he points out some exceptions). An alternate explanation for Texas might be that local regulators "adopt rates with but little or no investigation as to what rate ought to be fixed." Professor Morrissey's selection criteria, unfortunately, excluded all firms located in the local-regulation states of Iowa, South Dakota, and Mississippi (see footnote 2). The one Minnesota firm included in his study, however, ranked well above the median both in percent of return on common equity and on total capital.

The foregoing does not necessarily prove that the local rate regulation of electrical utilities in Texas is more lax than the state-level regulation of adjacent states. All that can be said definitely is that during the years 1951 to 1955 consumers of the product of the locally-regulated Texas firms studied paid an average price which was more than seven percent per unit higher for their electrical service than was the price paid by consumers of the services of the state-regulated non-Texas firms studied, and that during the same period relative profits of the Texas firms averaged more than twenty-five percent higher per dollar of assets owned than did the profits of the non-Texas firms. At least until further studies are made, however, one could not be criticized severely for suspecting that local regulation of electric rates in Texas results in higher prices to consumers and higher profits to electrical utilities than would be forthcoming under rate regulation at the state level as practiced in neighboring states.

ROY J. SAMPSON

Texas Technological College

The Velocity Theory of Population

ACCORDING to the quantity theory of money, primitively expressed, the total supply of money (M) exchanges for the total supply of goods offered in trade (T). For the only market function of money is to operate as a medium of exchange. If the supply of money doubles or is halved without a corresponding increase or decrease in the supply of commodities offered in trade, the price level (P) must also double or be halved since at all times all the money, having no other than an exchange function, is needed to purchase all the goods. As a result, the primitive quantity theory is expressed by the formula $P = \frac{M}{T}$.

There is however a slight snag to it. For a dollar bill does not only purchase a dollar's worth of commodities offered in trade: It purchases a dollar's worth of commodities each time it changes hands. The person receiving it can at once buy something else with the same bill; and so can the next, and the next. If in a closed community a million dollars worth of goods is offered in trade, a million dollars in money is needed if each bill or coin changes hands once. But if they change hands twice, that is if their velocity (V) doubles, only $500,000 are needed to effect a million dollars worth of transactions, and only $100,000 if the velocity is 10.

In other words, a change in the *velocity* of money has the same effect as if the *quantity* of money had changed. As an inflation may thus be caused quantitatively by an increase in the supply of money, it may also be caused qualitatively by an increase in the money's velocity. When this happens, as for instance in the case of panic, a tightening of the supply of money would have no restraining effect whatever on the price level. Only the administration of a mass tranquilizer slowing down the velocity of monetary circulation would in this case be capable of producing results. Because of the quantitative effect of velocity, the adjusted theory reads therefore; $P = \frac{MV}{T}$. There are other refinements but these are not needed for the purposes of this article.

The interesting thing about the quantity theory is that its underlying principle applies also to population problems. For just as the price level changes in response not only to monetary quantity but also to velocity changes, so the density of a population may change not only as a result of a change in its

physical size but also because of a change in its pace, the velocity of its movement.

In analogy to the quantity theory of money we may therefore formulate a quantity theory of population. Primitively expressed, it states once more the obvious: that the density of population (D) is determined by the size or number of a population (P) in relation to available living space (L). Its formula, similar to the primitive monetary formula, reads therefore: $D = \frac{P}{L}$. This means that, if a rise in the population figure increases its density to the point of overpopulation, two solutions are possible. One is to reduce P through either birth control or emigration (if Mathus' positive checks—war, famine, disease—fail to do their macabre job). The other: to enlarge L through either conquest (extensively) or through the mobilization of technology (intensively). Since the population theory has never been pushed beyond its primitive formulation, no other solution could so far have been offered beyond these two.

But as in the case of its monetary cousin, here too a modification becomes necessary if the formula is to take into account all forces exerting pressure on density. For, as already indicated, the quantity of a population may increase not only as a result of an influx of more people but also as a result of an increase in the pace (the velocity) with which people move. This explains, for instance, why theaters must have emergency exits though ordinary exits are amply sufficient for audiences moving at ordinary pace. But if the velocity of movement doubles under the impact of apprehension or quadruples as a result of panic, the effect is the same as if the audience itself had doubled, or quadrupled. Dealing with the problem quantitatively, theaters furnish a greater number of exits than are normally needed. But, were it not for the brevity of time available in an emergency, they could deal with it also qualitatively, as indeed they always try when they exhort their audiences that, in case of fire, they should keep their pace slow: *Walk, Do Not Run.*

As a result, according to the adjusted theory, which because of its emphasis on the volume increasing effect of pace may be called the ***velocity theory of population***, density is determined not by population number alone but by the number of a population times its velocity in relation to available living space. Its full formula should therefore read: $D = \frac{PV}{L}$.

This indicates that there exists a largely ignored third solution of overpopulation problems aside from the first two which resulted from the primitive formulation of the population theory. This is: reduction of the velocity with which people move. The new alternative is the more significant as the two older solutions seem to have reached the limit of usefulness; the one—territorial expansion—because, even in the age of sputniks, the supply of physical space capable of absorbing excess populations is nearly exhausted; the other—technological progress—because, whatever may be added in living space through more intensive exploitation of existing resources, tends to be lost because of progress' concommittant side effect of increasing man's velocity. Thus, instead of solving the problem of overpopulation, technological advance merely changes its character from a quantitative to a qualitative problem, from one involving the number of particles to one involving their speed. Moreover, since accelerating velocity must ultimately have the effect of increasing the mass of a population at a faster rate than the rate at which progress can come forth with appropriate solutions, technological advance has the tendency beyond a certain point not only of *changing* overpopulation problems but of actually *aggravating* them.

This is why remedial measures, such as are now universally applied, for example in all modern urban areas, seem invariably to create more problems than they solve. The most common of these, and the most symbolic of contemporary overpopulation problems, is the traffic glut, attributed by most planners to the fact that too many people have come to live together in too narrow a space. Interpreting and therefore attacking the problem quantitatively, they try to solve it through more and better highways, one-way streets, unobstructed over and underpasses, ampler parking facilities, and so forth. The result? Worse traffic gluts after every improvement than before.

For gluts are the product not only of too many people in a given area but, like the gluts of logs floating down rivers, also of the pace with which people move. And pace is, of course, not reduced but increased by the construction of new traffic facilities which, while likely to shift the location of the problem, are unlikely to diminish it (unless all terminal points such as cities were to be eliminated and all people kept moving in the flow of traffic all their lives). Numerically, the population of New York is about eight million. But multiplied by its daytime velocity, its mass (depending on the hour) is in effect that of a population of twenty to fifty million with the result that the same city, which is amply adequate at the near zero velocity prevailing at night or the low velocities of late evenings, is hopelessly inadequate at the high and increasing velocities of the day. Ancient Rome, with two million inhabitants but a velocity that was slow even at daytime, produced few accounts indicating that it suffered greatly from overpopulation problems. Nor did the beehive populations of medieval cities. Twentieth-century New Brunswick, New Jersey, on the other hand, with a mere 40,000 inhabitants but a daytime velocity that multiplies its mass perhaps tenfold, is glutted from morning to night, day in, day out, not in spite but because of the effort of modern municipal governments to speed traffic by every means, including, if necessary, through the gradual erasure of their cities.

Thus, technological improvement, far from correcting crowd conditions, actually worsens them because of the effect it has on the pace of life. Another factor responsible for intensifying over-population problems as a result of its accelerating influence on velocity lies in the improvement achieved in techniques of administration which, spurred on by technological improvements, permitted a high degree of social and economic integration. Previously, remote and largely autonomous districts discouraged large-scale movement since they hardly ever required contact with their distant central government. This changed when technical advance brought them closer to administrative centers and they could be assigned special as well as specialized roles in the integrated pattern of their national societies. For with increasing integration came increasing contacts; with increasing contacts, increasing communication; with increasing communication, increasing velocity; and with increasing velocity, an increase not in the number but in the *effective* mass of the people. A provincial, who used to visit his capital or other cities perhaps once in a life time for pleasure, must now visit it with increasing frequency on business, to straighten out things which got entangled in the process of centralization. And while it looks to him, and 9,999 others of his kind, as if he were visiting Washington only ten times a year, the collective entry in Washington's statistical surveys recording the same data lists not 10,000 but 100,000 visitors—10,000 actual visitors times their velocity. And the corresponding accommodations must, of course, be adjusted to a crowd not of 10,000 but 100,000.

The modern problem of overpopulation thus being so largely a problem of velocity rather than of actual population number or living space, it follows that it can be successfully attacked only if remedial measures are directed not at the population or space but at the velocity factor. But how can this be reduced in an age whose every invention and policy seems to speed it up?

The answer is not too difficult once we find what makes people move at the density increasing pace of our day. Is it cars? Indeed! But cars are primarily a means not a cause of movement. The principal cause of the acceleration of modern movement is the necessity of spanning what may be called *technological* distances, that is distances imposed not by the need but the tools of social existence. Amongst these may be ranged the growing distance between home and work made possible through high-speed commuting facilities; the growing distance between factories of parts and factories of wholes resulting from increasing specialization; the growing distance between producer and consumer; between residence and administrative center; between home and market, home and school, home and theater, home and inn. The wider these become, the greater becomes social speed, the more so as most persons are normally involved in the task of spanning not one but several of these distances every day, thereby increasing glut, crowd, accident, and other overpopulation problems at a geometric ratio with every arithmetic increase in the distances to be negotiated.

This being the case, the answer to the modern in contrast to the older problem of overpopulation lies, paradoxically, not in

expansion but contraction. While expansion, such as we witness in the widening urban sprawls, reduces *physical density* by spreading a given population (P) over a wider living space (L), this very process increases more than proportionately *velocity density* by permeating the wider L with greater V. This is why, after a given point, communal expansion produces more burdens than gains. Contraction, on the other hand, while adding to the physical density of communal centers through the narrowing of L, diminishes aggregate density (D) through the more than proportionate reducing effect it has on velocity density. Theoretically, velocity could of course be reduced also by legal speed limits which would ultimately also draw populations physically more tightly together simply because at low speeds they cannot afford to live too far apart. But practically the only reliable method seems not the *control* of speed but but the elimination of the *motive* of speed through the elimination of technological distances.

The solution of overpopulation problems offered by the velocity theory is therefore the very opposite from the one tried during the first part of the twentieth century on the basis of the more primitive quantity theory of population. Instead of increasing the growing sprawls of undefinable, cancerous suburban galaxies, it suggests that cities become cities again; that is metropolitan centers of smaller area, larger populations, and yet lesser aggregate densities, resulting from the restoration of a largely pedestrian mode of life.

To bring this about, one must above all deprive people of the motive of commuter travel by persuading them that, instead of maintaining expensive suburban prestige dormitories, it is both more sensible and more elegant to *live where you work and work where you live*. Once this is understood, the most wasteful of technological distances accounting for perhaps 60% of all traffic and road gluts will have disappeared. But commuting is only one of the motives of movement responsible for modern superdensities. Other things besides one's working place must therefore be brought back to within walking distance such as operas, museums, universities, sidewalk cafes, and similar amenities of social existence which can now be reached only with expensive high velocity means of travel. This is why so few of them exist: not because interest in them is lacking or admission cannot be afforded but, servicing 20 or 30 million people spread over thousands of square miles, the price of getting there is too high. But once every town of perhaps 30,000 inhabitants offers these institutions in urban arrangements free of technological distances, its citizens, when invited to travel to Paris or Milan, will soon ask: "What for? What can I find there that I cannot find at less cost in our own town?" The effect will at once be a significant lessening of crowd conditions; seats in the opera will again be available without the need of half a year's prior reservation, and leisurely visits to museums and galleries will be uninterrupted by the barbarian shocktroup invasions of contemporary tourist hordes.

The only question is: Could smaller cities afford the sums needed for maintaining theaters or universities of a caliber that would effectively diminish the motive of travel? The answer is: "Of course not, as long as their citizens have to spend the sort of sums now needed for the maintenance of highways, cars, and other instruments of integrated long-distance and vast-area living. But once velocity expenditures resulting from purely technological travel are reduced to nearly zero, the savings would be such that, as the far less endowed Italian and German city states of earlier ages have shown, even relatively small towns could afford not only first rate theaters, universities and galleries, but many other things besides, such as splendid cathedrals, parking places and streets laid out in marble, fountains, swimming pools for horses, and what not.

The reduction of social movement to purposes of commerce, holidays, and adventure, would thus have both a social and an unexpected cultural consequence. In the first place, it would lead to a significant diminution of the effective density of populations, thereby relieving the pressure of one of the worst problems of our time. And secondly, it would restore to the city its original mission of being a center of leisure, thought, elegance, and culture. To turn the velocity theory into a tool of policy, however, more is needed than its mere statement. Its variables must be expressed with greater precision by mathematicians, and movements such as those motivated by commuting, entertainment, cultural, and commercial reasons must be measured statistically before plans can be worked out on the basis of its principles. But this would exceed both the purpose of this sketch and the talent of its author.

University of Puerto Rico LEOPOLD KOHR

Hawley and Duncan on Social Area Analysis: A Comment

IT is, no doubt, an understatement to say that Professors Hawley and Duncan question the value of social area analysis.[1] Their paper is concerned with two major points: (1) the techniques of social area analysis; and (2) the lack of a theoretical framework explaining why "residential areas should differ one from the other or be internally homogeneous." (p. 340) The major work under their scrutiny is that of Shevky and Bell.[2]

Unfortunately for the outside observer of sociological research, an attempt to follow the analysis is somewhat analogous to following the street car conductor whose guttural calls are meaningful only to himself. While his actions may fill the car with a lot of noise, it does not tell the stranger where he is or when to get off. As other non-sociologists concerned with metropolitan research may be interested, it is worth noting the points of difficulty.

The critics' first concern is that Shevky and Bell fail to distinguish between social areas and geographic units. "They hopelessly confuse their exposition by classifying geographic units . . . and calling the categories of this classification scheme "social areas.' " (p. 337) Yet Shevky and Bell seem to be explicit that, "each census tract population was given three scores, one for each of the indexes of the factors; and then tract populations with similar configurations of scores on the three indexes were grouped together into larger units called social areas." (3) Thus, it appears that Shevky and Bell merely intended that social areas consist of tracts having similar profiles on the three indexes. While this use of the term "area" may not be the most common, it is quite familiar to most social scientists. If, for example, one chooses to define as a grouping regions having over 50 percent of the employment in manufactures, it would appear legitimate to aggregate all regions in the nation satisfying this condition. It may be that the researcher is interested in the income levels in these regions in the aggregate when compared with non-manufacturing regions. If, in turn, it is found that manufactures is associated with higher incomes, a statement that manufacturing areas have higher incomes is quite meaningful. It is not that these areas are contiguous, but simply that regions satisfying the attribute "manufacturing" when aggregated into an economic "area" have certain relations with respect to other variables of interest.

Disregarding the issues in aggregating census tracts into social areas, Hawley and Duncan are concerned with the degree of heterogeneity within census tracts. They claim that the Shevky-Bell statement that, ". . . . the social area generally contains persons having the same level of living, the same way of life, and the same ethnic background," (p. 20) is "patently false." (p. 338) They point out that a tract with 25 percent Negro and 75 percent white is hardly made up of persons with the same ethnic background.

This criticism is hard to follow. If, say, 27 census tracts each had exactly 25 percent Negro and 75 percent white, why is it wrong to aggregate these into a social 'area'? Would the homogeneity of the "area" be improved if the same 27 tracts had between 96 and 100 percent white? If this is the case then, for example, economists had better beware. It is no longer legitimate to aggregate together firms which exhibit a specified degree of oligopoly power for further analysis. Oligopoly power for a firm may be looked at as a cross between pure monopoly and pure competition. Since the basic unit is, in some sense, heterogeneous, evidently this would be a bad aggregation. The moral, no doubt, is that Shevky and Bell have a classification system useful for the problem they wish to consider. As usual, for some other problem some other system may be useful.[3]

[1] Amos H. Hawley and Otis Dudley Duncan, "Social Area Analysis: A Critical Appraisal," *Land Economics*, November 1957, pp. 337-45. Hereafter referred to by pages between 337 and 345.

[2] Eshref Shevky and Wendell Bell, *Social Area Analysis: Theory*, Illustrative Application and Computation Procedures: Stanford Sociological Series, Number One (Stanford University Press, 1955). Hereafter referred to by pages between 1 and 23.

[3] It may be argued that the grouping together of census tracts whose averages are the same does not account for differing distributions within each tract. Since this is a qualification to a great deal of research and is, supposedly, well known to Shevky and Bell as well as to their readers, it may be dismissed.

At this point the critics turn to the theoretical basis of social area analysis. "One searches in vain among these materials for a statement explaining why *residential areas* should differ one from the other or be internally homogeneous." (p. 340, *italics theirs.*) Note immediately, in terms of the discussion of the previous paragraph, this is irrelevant for the Shevky-Bell analysis. If tracts differ, aggregate those that differ by the same amount into a social area. If they are homogeneous, aggregate the ones exhibiting the same type of homogeneity into a social area. Students of land economics, however, will be interested in some of their suggested approaches.

The critics postulate and reject the "analogical" approach as follows:

> The city is a nucleated system of interdependences, therefore it should have some parts corresponding to regions, that is, *sub-areas of physical homogeneity.* Thus in the analogical approach there is a primary emphasis on area as a physical fact, while the characteristics of the occupants are treated as *dependent* variables. Much of the early 'natural area' usage seems to have been cast in this form. How the independent variable is expected to operate to produce homogeneity is not clear. Presumably the physical features of a sub-area may either mold the human occupants to a common type or *they may select occupants of a given type.*
>
> It has frequently been observed that geography is reduced to space in the city. This is to say that the determinants of location in the city are site rents and transportation costs. Every other physical feature is subordinated to these considerations; it may even be removed or in other ways neutralized if the locational values gained thereby warrant the expense. What, under these conditions, is the nature of physical areas in the city? It would seem that the only meaningful physical areas would be those created by occupants of a given type, e.g. factory districts, low income housing districts, etc. But this places the regional analogy in a tautological position. If the only physical distinction a subarea may gain is derived from the building structures erected by its occupants, area becomes a dependent variable rather than an independent variable. In consequence, the regional analogy, at least in its casual implications, breaks down in the urban setting. (p. 341, *italics mine.*)

While Hawley and Duncan do not put forth this theory as their own, it is, in any case, naive.

It would be a mistake to accept as the only definition of a region "sub-areas of physical homogeneity." While this does describe such phenomena as "corn belts," "residential areas," and so forth, it is perfectly legitimate to consider as regions two or more heterogeneous spatial areas with similar structures. For example, it may be useful to classify two nucleated sub-areas as similar regions.

Disregarding the issue of homogeneity versus heterogeneity, the major pitfall in such an approach is in the casual analysis. Areas do not, in any equilibrium analysis, select occupants. The physical nature of a region within a city, say a census tract, is determined by a mutually interdependent simultaneous system of equations. The occupants of an area have bid for that resource (land area) in terms of their demands vis-a-vis others' demands and alternative supplies (other land areas). Clearly, in terms of demand and supply, site rents and transportation costs are important. The first paragraph which, somehow, places the types of occupants as a dependent variable does not make sense.

After rejecting the "analogical" approach, the critics turn to the "functional system" approach. The basic theme is the interaction of various units and the proposition postulated is, "that all units X which have a given frequency of exchanges with any single unit Y will have locations equidistant from Y." (p. 343) To be completely clear, this statement needs the explicit statement, "if X units have contact only with Y and none (or all) have contact with Z, where Z is not at Y." In the real world these would merely account for the case of two persons who work in the central business district, one of whom prefers golf and the other night clubs, picking residences which are not equidistant from the central business district.

The critics note the important point that an activity "must have sufficient space in which to carry on its processes." (p. 344) Thus, residential sub-areas of certain types must have sufficient yard space for certain types of familism to exist. Here again it is the role of land rents to allocate such resources to these needs. And it is at this point that a more general observation might be made.

While these remarks have been critical, Hawley and Duncan—and Shevky and Bell, in our judgment—have made interesting suggestions concerning social interaction within metropolitan regions. Presumably,

land economists would argue that site rents and transportation costs, which enter into site rents, are dominating features in producing the metropolitan structure. If the work of sociologists, city planners, geographers, and others concerned with city structures is to be based on sound economic analysis, it is necessary to formulate better theoretical urban models in terms of spatial rent theories which recognize the role of transportation inputs. And this, one would suppose, is the job of the urban land economists and not of our colleagues in other disciplines.

CHARLES M. TIEBOUT
Northwestern University

The Itinerant Trucker: A Problem in Business Growth

PART II of the Interstate Commerce Act, which concerns motor carriers, contains, among other things, an exemption from economic regulation which relates to the for-hire carriage of unprocessed agricultural products.[1] A substantial segment of the "for hire "trucking industry operates by taking advantage of the exemption cited. The majority of the operators thus employed are owner-operators; that is, the truck owner is the driver, office manager, sales force, and sole proprietor of the firm. Since most of the largest trucking firms grew from such small beginnings, it is instructive to consider the likelihood of the economic growth and development among the firms which make up the "exempt" trucking industry. It does not seem likely that many such organizations will grow into large firms. Indeed, many of them will fail to survive even in their present form.

Investigation indicates that two factors are primarily responsible for this situation: (1) an inadequate capital structure, and (2) lack of adequate internal control, especially insofar as costs and taxes are concerned. Both of these factors are compounded by a frequent lack of knowledge about business structure in general and the fact that entry into the industry is much too easily accomplished in view of the operating and financial problems which the successful operator must overcome.

From the earliest days of commercial motor carrier operation on a "for hire" basis, economists generally have believed that one of the factors which characterized motor truck transportation and set it apart from other transportation industries, railroads in particular, was the factor of low fixed costs relative to total costs. Of course, railroads face fixed costs far above those of the average motor carrier in regard to charges on capital investment, taxes on real property and on certain basic maintenance of the physical plant. Nonetheless, many truck operators who own and operate only one or a few vehicles leave the industry because they are unable to meet the fixed obligations of remaining in business.

Let us examine the fixed and variable costs of for-hire motor truck operation:

Fixed	*Variable*
1. Registration fees and licenses for vehicles.	1. Fuel and oil maintenance.
2. Office expense.	2. Drivers' salaries.
3. Garage, storage, office, and loading dock rent or maintenance.	3. Taxes paid on basis of mileage operated or fuel consumed.
4. Salary of owner and prinpal officers.	4. Tolls, expenses on road, etc.
5. Payments to amortize equipment.	5. Taxes paid on income or profits.

Items 2, 3, and 4 of the fixed expenses may be nominal or non-existent for the typical owner-operator with whom this paper deals. This is true because of the informal method of operation of most of these carriers. Many such truckers operate from their homes or from "truck stops," thus eliminating any expenses of garage, loading docks, etc. Record-keeping and accounting are most often done by the trucker himself or a member of his family or at best by utilizing the services of a public accountant or bookkeeper. In such cases, expenses of plant and office administration may be completely eliminated or substantially reduced as compared to those of a regulated motor carrier or a rail carrier.

To a degree, expenses in each category might in some cases be justifiably interchanged. Although maintenance is directly related to miles operated, some basic main-

[1] *United States Code*, Title 49, Section 303(b), 6 (Interstate Commerce Act, Part II, Section 203(b), 6). Serious problems have revolved around the definition of an "unprocessed" agricultural product, but these problems are not within the scope of this paper. See *The Agricultural Exemption in Interstate Trucking*, Marketing Research Report No. 188, United States Department of Agriculture, Agricultural Marketing Serivce, Marketing Research Division, Washington, D. C.

tenance must be performed even though the vehicle remains idle for substantial periods. On the other hand, office expense of some sort is necessary even though operations are at a low level; but extended operations which bring the operator into contact with more states increase liability for taxes and reports, thus increasing office costs substantially.[2] However, on a yearly basis most of the costs in Column 1 are fixed, while those in Column 2 are variable.

The paradox of the motor carrier operating costs is found in item 5 of the fixed costs; i.e., high cost of equipment amortization. It is likely that for the small owner-operator this item is larger than any other; and it is outside the control of the operator unless he chooses to dispose of his vehicle and retire from business. A suitable tractor semi-trailer combination can be purchased for a down payment of modest size. The monthly payments are comparatively large and continue over a substantial period of time.

Prices for equipment vary considerably depending upon make and type. In 1957 a new tractor of a commonly used make could be acquired for $8,000 to $12,000, and a non-refrigerated semi-trailer could be secured for $6,000 to $8,000; thus the total unit price ranges from $14,000 to $20,000. If a typical unit is assumed to cost $16,000 with a $2,000 down payment, the balance of $14,000 (exclusive of interest) might be paid at the rate of $388 per month on a 36-month basis, or $582 on a 24-month basis.

On the 36-month basis, the vehicle would be near, if not at the end, of its economic life by the time the cost had been amortized. Much discussion is carried on by motor truck operators as to the relative advantage of acquiring larger, more durable, and expensive equipment, as opposed to a policy of acquiring lighter and less expensive equipment which must be replaced more frequently. Questions of state weight limits, geographic character of the area generally served, and commodities carried must also be considered.

In any case, after three years of operation the vehicle would require substantial outlays for repairs and replacement of parts. If, as is often the case, the operator had not set aside any funds to cover depreciation, he would face the prospect of acquiring new equipment under the same conditions, and the cycle would be repeated.[3]

An owner-operator can acquire used equipment with a smaller down payment. Under these conditions informal arrangements can be made between buyer and seller which doubtless are more liberal than the formal agreements of sale for new equipment.

Considering the brief business life of many one- or two-truck operators and the life of the equipment, it is likely that amortization continues during the entire period of his operation. The trucker thus finds himself faced with a substantial fixed cost which must be met faithfully if he is to continue in business. Nor can the trucker defer this expense as is sometimes possible in the case of maintenance or some other fixed costs. The seller may grant some leeway under certain conditions, but such a reprieve must be limited.

An operator either fortunate or astute enough to amortize his vehicles at an early stage avoids this dilemma and enjoys the advantage of predominately variable costs of operation. This problem is particularly ironic, for the only real fixed costs which the owner-operator has are equipment obligations and annual fixed operating licenses and fees but, because he does such a small-scale business, even these costs are frequently beyond his capacity. To complicate the situation still further, the owner-operator, burdened with a substantial fixed cost in the form of equipment amortization, rarely has the assurance of a relatively stable rate structure.

The very flexibility and informality of operation which makes the services of the "exempt" carrier valuable means that rates are most often determined on the basis of individual bargaining either directly between the trucker and the shipper or with the assistance of a third party; namely, the truck transportation broker. Such rates are subject to wide variations depending upon the supply of and the demand for truck trans-

[2] For example, the author and his associates have found that the widespread increase of fuel use and mileage taxes among states has made increased office overhead a common problem to motor carriers. See *Highway Barriers in 20 States*, Marketing Research Report No. 157, United States Department of Agriculture, Agricultural Marketing Service, Marketing Research Division, Washington, D. C. March 1957.

[3] In many cases, the operator of a one- or two-truck organization lacks the accounting sophistication to make such a provision. In other cases he may be unable for financial reasons to put money aside because it is needed to meet daily expenses.

portation services.[4] Even an astute "exempt" trucker who had full knowledge of his costs might find himself squeezed between high fixed costs on one hand and a variable revenue structure on the other hand. It seems likely that those truckers who have a superior capital structure in the form of fully amortized trucks can in the event of economic pressure reduce rates even further, thus making it even more difficult for the trucker burdened with large payments to survive.

Doubtless, under the pressure of meeting these fixed obligations and because of ignorance of his true costs the operator undertakes many uneconomic operations. Such short-sighted action can often be attributed to ignorance of the real costs involved but it seems likely that the more fundamental cause is lack of adequate financial resources. Since the operator tends to use his operating revenue to meet the needs of his daily living expenses as well as those of his business, he is rarely in a position to refuse any offer which will cover what he believes to be his out-of-pocket costs.

The classic remedy for this problem is a restriction on entry into the field; however, there is a serious need for the service this type of trucker can give. Large carriers having sufficient capital to expand and acquire equipment are not so well tuned to the needs of the very small shipper and especially to the shipper of agricultural commodities whose needs are seasonal. The one- or two-truck operator has the flexibility to serve these shippers and they could ill afford to be without his services. It is doubtful if any regulatory agency has sufficient flexibility to deal with this problem and still meet the needs of the agricultural shipper.

The growth of motor carriers may also be inhibited by problems of internal control. Unlike many other types of business activity the operator has a serious control problem stemming from the fact that he is seldom able to be at "headquarters" for any length of time but must instead spend most of his time on the road. The typical owner-operator, operating one truck, minimizes his control problem by virtue of the fact that he is personally able to collect and record the basic data for management purposes, such as receipts, toll tickets, mileage records and other data relative to the status of his business. He must use his spare time at home to see that reports are made and records are kept reasonably current.

The most serious control problem seems to arise when the trucker operates three, four, or five vehicles. Typically at this level, he is forced to drive one of the vehicles himself, employing drivers for the others. He is unable to exercise full-time managerial functions and is seldom in a financial position to hire others for this purpose on a full-time basis. This problem, sufficiently complex, is made more so by the fact that his vehicles are ranging far and wide, creating a control problem which would be difficult under the best conditions. Most truck drivers are not "record minded" and few of them are enthusiastic about gathering or keeping data for record purposes.

In recent years, with the growth of various types of tax which require periodic reports, the control problem has become more acute and it is likely that many truck owners are reluctant to expand their operations and thus increase the managerial burden.

It is true that present large organizations grew from one- or two-truck companies; nonetheless one is tempted to speculate about the relative dearth of tax reports in the years prior to the second world war and the influence which such reports have had upon the problem of internal control. Has the internal control problem become so complex as to present a barrier to the trucker making it difficult for him to reach the stage where he can operate enough trucks to justify a control staff and to restrict himself solely to management duties?

In view of the absence of economic regulation the type of operations carried on by most small operators who hope to become "big operators" is in the field of produce-hauling. Such truckers are faced with an especially troublesome record-keeping and paper-work problem because they often operate seasonally and their operations seldom follow a set geographical pattern.

On the positive side, there is no doubt that a system of forced record-keeping imposed by tax systems enables the trucker to get a much clearer picture of his operations and may stimulate him into using the data thus collected for other managerial purposes. This has certainly been the history of the tax situation in other industries where income

[4] "Exempt" truckers have attempted to stabilize rates through various types of group action (e.g., the recently organized National Agricultural Transportation League). It cannot be said that their efforts have been very successful.

and other tax data have had important uses in devising better cost controls. This is not enough per se to justify the imposition of elaborate tax systems, but it is a useful by-product.

Some immediate progress can be made through simplification of tax reporting systems. This is not a problem peculiar to truckers but, since each state requires approximately the same type of information, there is no reason why a high degree of standardization could not be achieved. Standardization is especially desirable in the reporting of fuel-use taxes in the various states and in the procedures necessary for operating authority. Enormous amounts of time are taken up in preparing the various applications and affidavits, each seeking substantially the same information but with enough variation to necessitate separate preparation.

Alleged complexity is a common means of attacking taxes but the complaints about complexity of motor truck taxes are so widespread as to merit consideration. They are voiced by operators, large and small, educated and uneducated, conscientious and otherwise.

The results of the situation discussed in this paper are unfortunate from the standpoint of the individual. It is not likely that they constitute a serious problem from the standpoint of the economy nor is there indisputable evidence that the availability of transportation service in general is limited by such problems although in specific geographic areas or for some products the problem may be acute. No shortage of exempt carriers is apparent. Any unfortunate economic effects are also mitigated for the individual by the fact that it is common for exempt truckers to be engaged in various activities such as farming, produce selling, and other activities apart from, but related to, for-hire trucking; thus the operator can vary his economic activities in tune with the existing conditions.

Apart from the effect on individuals, the maintenance of the status quo is not enough; there must be a strong potential of economic growth in order to provide an opportunity for development within the industry commensurate with that of the past.

HUGH S. NORTON

The University of Tennessee,
Knoxville, Tennessee

Book Reviews

Cities In Flood. The Problems of Urban Growth. By Peter Self. London, England: Faber & Faber, Ltd., 1957.

No well-stocked planning larder should be without this book. No after-dinner speaker evaluating British new towns, British town planning, and the future of American planning and renewal programs should have the temerity to broach such subjects publicly without a thorough knowledge of this book. In fact, until it is outdated by the next discussion of British planning by an Englishman or American, this should be considered as the lead statement.

Cities in Flood now supersedes Lloyd Rodwin's *The British New Towns Policy.* This is not to belittle Rodwin's book but it recognizes the inevitability of time. Books such as these will have to come out once a year because of the speed with which the British program is moving and the concommitant change in both political, economic and administrative fronts, let alone the changes in physical accomplishment.

Peter Self writes quickly, with lucidity, and with a certain compulsion which carries the reader with him. He puts down what he feels and what is to be said, neatly and with logic. We find here a very broad base for the analysis of the reasons for the present programs in England. Self assumes a comforting intelligence of his reader. So there is a minimum of historic review and the maximum coverage of what is occurring, why it has occurred and what is to be done about it. "It" in this case is the change in the population front, change in the industrial base, and change in the entire world of planning and housing as developed since the war. This reviewer has spent some time in many of the British and Scottish new towns, with the London County Council and with those responsible for reconstruction planning in war damaged areas. He, however, does not consider himself adequately knowledgeable in so complex and so rapidly moving a field and it has been at least twelve months since he made the rounds in England. Keeping up with the literature of the subject is no easy matter and steering clear of political and personal biases is also not an easy thing to do. Self himself does not avoid both expression of opinion and bias. In fact, his is the frank and wholesome approach that makes this one of the most engaging books on the urban problems that the reviewer has encountered in many years.

But to those of us who have been involved in American public administration and the problems of community growth as they are reflected by our own peculiar form of government, this book is perhaps one of the most extraordinary which has come across our desks. Its unique quality lies in the complete and undeviating acceptance of the public "authority" as the responsible agent for the accomplishment of major new town and old city renewal objectives. This reliance on "authority" government seems to be completely unquestioned in Mr. Self's mind. The result is that we have a book in which reference to private enterprise in the field is oblique and almost completely missing. It simply does not occur to Mr. Self that private enterprise has an important role to play in urban building and rebuilding. It is not a question of antagonisms. He has simply weighed for himself the respective roles of local government, county government, national government and the private entrepreneur. The entrepreneur is featherweight.

It is clear that Mr. Self is a determinist and a very special kind of determinist. He believes that the self-determination which must be fundamental to action is a governmental responsibility. He says: "The most crucial problems have had to be faced by the larger cities. Theses cities are inescapably committed to considerable reduction in their populations." This is typical of a theme which runs through the entire book. It is the cities that are committed. It is the counties that are committed. It is government itself which is fully responsible for decision-making. On the other hand, it is quite clear that, although Mr. Self does not question the responsibility of government in the com-

munity development and redevelopment picture, he is thoroughly willing to criticize all forms of government action and inaction. Seldom has a book been written which so brilliantly castigates bureaucracy and so clearly demonstrates the battles for power and prestige between county councils, local governments, and the national government. Few books demonstrate more clearly the wide divergence or distinction between local government in Great Britain and local government in the United States. Mr. Self makes no attempt to make such a distinction. This is a completely British book, written for a British audience and with apparently no other audience in mind. This, in itself, makes it both an interesting document and one which, because of its clarity of intent, is most helpful in distinguishing the difference between selling a point of view and simply expressing it.

Mr. Self's analysis of the British authority system, the controls of land use and of land use planning, and the successes and failures of new towns, of greenbelts, and planned industrial areas, make fascinating reading. Perhaps one of the most intriguing aspects of the book is his completely complacent attitude about administration and financing programs which we hardly dare consider here. For instance, the idea that a city can colonize where it wishes outside its boundaries and that it can spend its own funds for the acquisition of land for a new town seems perfectly simple, reasonable, and logical to Mr. Self. It is as natural as anything that might be done of this nature within the city limits. What comes out of the entire analysis is the extraordinary role that the authorities, the councils, and commissions play in the mildly socialized land of Britain.

That Peter Self recognizes the emphasis is quite apparent. The author says in his interesting chapter, "Towards a New Policy;" "Public control means that claimants to land must argue out their case in public, instead of bidding for the land in private." He goes on to say: "It is not the task of planing authorities to (reconcile) land use conflicts in a judicial kind of way, but to impose policies of their own upon the pattern of development and land use. The coordination of land use is the method by which planning proceeds; but it is not its purpose." Mr. Self then goes on to urge a stronger part in the planning process to be assumed by the Ministry of Housing and Local Government.

For those of us who are still imbued with the full consideration of the powers of private enterprise and the activities of a strong local government—believing that it should be local plans locally arrived at—rather than central plans filtering to the locality—and to those of us who believe also that the term "authority" should not be applied to the officials or offices which carry out general or master planning functions at any level of government, this book is a fascinating intellectual enterprise.

We badly need an evaluation of our own planning failures and successes in this country. We need a book as concise, as brilliant and as readable as Mr. Self's book. This type of self-critical evaluation is a healthy one. However, I am afraid that until we are a little clearer in our own minds how we can work towards the accomplishment of the same general objectives and goals as have been somewhat clarified by the British system, we are going to have difficulty in self-appraisal of equivalent value. However, the more one studies the British system the more one realizes that here is a different way of administrative, political and economic life and from this is a growing and different type of planning and programming than what we have been able to achieve ourselves.

If we are to build the essential dams and multi-purpose reservoirs with which to impound or channel our own cities now flooding our own countryside, we must search out the equivalents to the British successes in this field. For they have had great successes within their special system of government. Our equivalents must be within our system, now lagging in this field of scientific endeavor.

CARL FEISS

Washington, D. C.

The Grand Trunk Railway of Canada. By A. W. Currie. Toronto: University of Toronto Press, 1957, pp. viii, 556, $7.50.

The Grand Trunk Railway was Canada's first major railway system, one destined to struggle through seventy years of relative poverty despite its important contributions to economic development before it finally passed into government hands in 1920 to become a major segment in the Canadian National Railways. Although it possessed highly important routes it could never quite

make the grade of becoming a first class prosperous rail system, partly because it tended constantly to "bet on the wrong horse"—the use of broad gauge, the chances of Portland becoming a major seaport, and insistence on the route south of Lake Superior to the west, for example. The road lagged behind the industry generally in modernization. Bad luck played a part in the difficulties, as for example the loss of Charles Hayes on the Titanic, the only top-flight executive the road ever had. But much of the trouble lay in absentee control; from beginning to end the company was almost wholly owned in Great Britain and controlled by a British board of directors.

Although the road built the first line across eastern Canada, from Montreal via Toronto to Sarnia, it was never able to capitalize on its initial advantages, and was guilty of numerous errors in timing. It delayed too long in acquiring the Great Western (Buffalo to Hamilton and Detroit) while the latter's own procrastination led to the building of the parallel Canada Southern. The Grand Trunk failed to build to the Pacific when it had a chance and soon the late-coming Canadian Pacific with its Midas touch and its powerful ally, the New York Central, was taking its through business and paralleling its old lines in Ontario. Meanwhile the road saddled itself with an excessive mileage of branch lines and suffered severely from governmental policy of subsidizing competitors, a policy which might have been avoided had the Grand Trunk enjoyed a better reputation. After a few years of moderate prosperity around 1900, the company proceeded to hang itself through the medium of the Grand Trunk Pacific, which it built to excessively high standards relative to traffic, and which became engaged in an exhausting struggle with the Canadian Northern. World War I brought final disaster; unable to raise capital, squeezed badly by rising costs in the face of rates held rigid by the government, and drained by the deficits of the western lines, the road was finally forced to accept acquisition by the government.

The Currie history is one of the most detailed railway histories to appear, and contrasts sharply with the semi-popular histories of a number of American roads which have appeared in recent years. Despite the high quality of the work it suffers somewhat from misplaced emphasis. Too much detail is included on corporate and financial history and on the relationships between management, stockholders and government and too little attention is paid to the general economic setting and the significance of the road for economic development. Even some basic data, such as dates of opening of various segments, are either missing or obscured in other material. But despite the limitations of emphasis the book is a very scholarly work and a major contribution to the literature.

JOHN F. DUE

Professor of Economics,
University of Illinois.

Great Cities of the World, Their Government, Politics and Planning. Edited by William A. Robson. New York: The Macmillan Company, 1957, pp. 814, 88 illustrations, 13 maps and diagrams, $11.

The first edition of this encyclopedic work was hailed in this *Journal* (May 1955) both for the 18 monographic essays on 20 cities and for the magistral synoptic essay by the distinguished editor. It is an encouraging sign of the increased concern with metropolitan problems around the world that a first edition was so soon exhausted. This second printing is a "new edition with additional chapters," which add 120 pages. There are three new monographs, dealing with Tokyo and Osaka, Cologne, Johannesburg.

Because of heavy printing costs, the editor's general survey has not been modified, nor have the 18 original monographs been revised, except to eliminate some (but not all) of the egregious errors of fact. Professor Robson has gained support for the validity of his basic analysis and interpretation by the concurrence of a Congress of the International Political Science Association in 1955, for which the first edition served as a general report, certainly the most stupendous "working paper" ever submitted to an international gathering.

This great work, despite some unevenness among the descriptive chapters, remains a "pioneer volume" which "affords fresh insights and understandings." It is an indispensable compendium.

CHARLES S. ASCHER

Brooklyn College

Recreation Places. By Wayne Williams. New York: Reinhold Publishing Corporation, 1958, pp. 302. $18.00.

The remarkable dearth of top-level books in the field of urban planning has long been with us. This volume is one of those all too rare excellent ones. Mr. Williams has presented an immensely stimulating, beautifully illustrated study on the recreational aspects of our society. The term recreation is expanded to include the more personal concepts of adventure, leisure and fun which are people-centered and neighborhood-oriented. It is the author's intention to involve the whole man in the complete variety of his daily existence.

Recreation is broadly defined to include not only traditional sports and play activities but all leisure time diversions. He claims that, "the goal of recreation is to *recreate* the human, not only from a physical point of view, but socially and emotionally as well." The book has a number of essays by leading recreationalists as well as mental health experts, social workers, artists and even college professors.

One of the latter, John E. Burchard, Dean of Humanities and Social Sciences of Massachusetts Institute of Technology, in an introductory essay states: "All of the recreation activities . . . seem to have suffered from too much concentration on making the main activity work well . . . going to the museum would be more fun if you would not have to look at so many pictures and could find the ones you wanted to see; and much better still if they did not have to be approached with so much awe. Sometimes a drink or two in the spectator will not harm the painting, even one by Giotto."

A story is related of the famous Finnish architect, Alvar Aalto, who criticized a group of student designs for a grade school. Each had incorporated radiant heating and north light and color and all of the essentials, but somehow all of the designs looked alike. Aalto had a simple but devastating question. "Tell me," he said, "Where does the lion come in the window?" Indeed we need more lions coming in the windows of all our public buildings. It takes courage to do something different, perhaps even spectacular; more courage than our official boards and civic leaders seem to have as a rule.

The author points out that not only is there too little inspired design in our recreation facilities but there is too much compartmentalization in recreation planning. There is a specific plea for the construction of integrated community recreation centers which will cater to a variety of recreational interests and experiences.

While some of the authors of specific essays tend to be somewhat fuzzy-minded about their "approaches" to the recreational field, the basic tone of the book is broadly conceived and stimulating. By the use of hundreds of sketches, photographs and maps, specific ideas of great talent and imagination are brought forth to supplement the sometimes too general text. Also included are a history of recreation, the needs for different age groups, types of recreation, European playgrounds (including some superb ideas on adventure and junk playgrounds), playground equipment, planning standards for recreation; and in a book of this type, what seems to be an extraneous chapter on sports fields and their lighting. There is also an excellent bibliography on leisure compiled by Reuel Denny and Mary Lea Meyersohn.

The aim of this book, to present a sweeping view of the whole field of recreation conceived in the broadest terms, it is hoped is a harbinger of a new spirit at least in the *literature* of planning.

ALFRED SHAPIRO

City Planning Department, Madison, Wisconsin

MISCELLANY

United Nations and Enlarged Technical Assistance Program

The United Nations took another step toward helping the less favored countries in their efforts to advance their economic development when the General Assembly adopted, on December 14th, 1957, a resolution calling for an expansion of the technical assistance and development activities of the international organizations. This action followed a proposal made several weeks earlier in the Assembly's Second Committee by the United States delegation.

The Resolution which was finally approved by the Assembly was sponsored jointly by the governments of Argentina, Canada, Ceylon, Chile, Egypt, France, Greece, India, Indonesia, Mexico, the Netherlands, United States, Venezuela and Yugoslavia. It embodies a decision to establish as "an expansion of present technical assistance and development activities of the United Nations and the specialized agencies, a separate Special Fund which would provide systematic and sustained assistance in fields essential to the integrated technical, economic and social development of the less developed countries."

The General Assembly visualized that the resources available for this Special Fund may approximate one hundred million dollars a year. (The current yearly budget of the technical assistance program is approximately thirty-one million dollars.) The additional resources would be used to expand the scope of the technical assistance program to include projects in certain basic fields: intensive surveys of water, mineral and potential power resources; the establishment, including staffing and equipping, of training institutes in public administration, statistics and technology, and of agricultural and industrial research and productivity centers.

The Assembly has also provided that "as and when the resources prospectively available are considered by the General Assembly to be sufficient to enter into the field of capital development, principally the development of the economic and social infrastructure of the less developed countries, the General Assembly shall review the scope and future activities of the Fund and take such action as it may deem appropriate."

The specific details of the new plan are to be worked out by a Preparatory Committee which will be composed of representatives of sixteen countries. The Preparatory Committee is directed by the new Resolution to define the basic fields and the types of projects which would be eligible for aid under the new Fund; to define the necessary administrative and operational machinery to carry out the enlarged program; and to ascertain the extent to which governments would be willing to contribute to the Fund. In doing so the Committee is to be guided by the views of governments, the advice of the Secretary-General of the General Assembly of the United Nations, the heads of the specialized agencies and the Executive Chairman of the Technical Assistance Board; as well as by the principles set out in an annex to the Resolution. This annex stipulates: (1) that the Special Fund shall be a multilateral fund of the United Nations with resources derived principally from voluntary annual contributions of governments and others; (2) that assistance from the Special Fund shall be given only to those projects which would make a contribution to the economic development of the requesting country and that the operations of the program shall not be influenced in any way by political considerations; and (3) that the fund shall be administered by a chief executive officer under policies established by an executive body in accordance with rules and principles laid down by the General Assembly and the Economic and Social Council. The major contributing countries are to be represented equally on the executive body.

The Preparatory Committee will submit the results of its work to the Twenty-Sixth Session of the Economic and Social Council of the United Nations in the summer of 1958 and final action will be taken by the Thirteenth Session of the General Assembly at the end of the year 1958.

Urban Planning Institute at University of Arkansas

The Fourth Annual Institute of Urban Planning will be conducted at the University of Arkansas from August 18 to August 29, 1958. It will be under the general sponsorship of the Southern Regional Education Board. Faculty members for the seminar will be drawn from the staffs of the University of Arkansas, the Georgia Institute of Technology, and other institutions.

The Institute will consist of a basic seminar to run for the full two weeks, plus a special, advanced seminar of one week from August 25 to 29. The basic seminar is intended primarily for members of city, county, and metropolitan planning staffs as well as personnel of state planning and development agencies who have not had formal training in planning but who desire to acquire basic background.

The Institute will offer for the first time an advanced seminar for planning directors and others in responsible positions. Those who have attended one of the previous three summer Institutes will be eligible to attend the advanced seminar, which will be concerned with specific problems of a more technical and professional nature that concern primarily metropolitan and regional planning personnel.

The primary goal of the series of seminars which comprises the largest part of the Program is to provide a general review of current planning techniques and basic planning principles. In addition, this year there will be special emphasis on problems and techniques common to metropolitan and suburban planning agencies in coping with urban expansion and suburban growth in the face of major technological changes. Some new techniques of low-density land controls and of open-space preservation will be explored, and the relationship of low-density development to metropolitan patterns and to municipal finances will be discussed.

In addition to the special sessions on problems of open-space preservation and low-density controls, seminars will cover such subjects as:

Modern concepts of planning
Public relations techniques
Urban renewal
Planning for schools and public recreation
Freeways, transit, and off-street parking
Planning programs for metropolitan areas
Subdivision control
Zoning Law and administration
Population surveys and forecasting
Long-range programming of public works

This Special Summer Program is open to practicing professional planners, to members and staff of planning commissions and urban renewal agencies, and to men and women in such related fields as architecture, public administration, civil engineering, utilities, real estate, and industrial development, who have a specific interest in comprehensive planning. Enrollment will be limited to about twenty-five people, so that there may be ample opportunity for all to participate in the discussions.

Seminar leadership will be provided by members of the faculty of the Department of City and Regional Planning and guest speakers selected for their ability to make a special contribution to the subjects under discussion. The planning seminars will be under the general direction of Roland B. Greeley, Associate Professor of City and Regional Planning.

Planning Programs at M. I. T.

The twentieth in the series of annual two-week Special Summer Programs in City and Regional Planning will be given during the 1958 Summer Session in the School of Architecture and Planning at the Massachusetts Institute of Technology from July 21 through August 1, 1958.

This Special Summer Program is designed to combine an opportunity for intensive review of the administrative and technical aspects of city and regional planning with a more thorough investigation of one major aspect of planning. The Program will have special interest for those directly concerned with urban or regional development, including men and women in the planning phases of real estate and industrial development, as well as for practicing professionals and members of planning staffs and commissions.

Among Articles Appearing in August 1958 Issue

Commercial Development of Highways in Urbanized Regions: A Case Study.....
Andreas Grotewold and Lois Grotewold

Exclusive Agricultural Zoning: An Appraisal II—Maximization of Social Product..
Jack Lessinger

Medical Care: A Public Utility?.....*Manuel Gottlieb*

Agricultural Co-operatives in Finland.....*F. Ray Marshall*

Funding of Building Amortization and Site Clearance Costs: A Proposition.....
Edmund Arthur Smith

Results of A Test of Air Photo Interpretation as a Tool of Farm Management and Land Economics Research.....*Kenneth C. Nobe*

Some Economic Considerations of the Multiple Use of Forest Land.....
Allen B. Richards

. . . .

ct . .
inger

ttlieb

shall

. . .
mith

and
Nobe

. . .
ards